A taxonomic revision of *Croton* L. (Euphorbiaceae) in Australia

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Summary

Forster, Paul I. (2003). A taxonomic revision of *Croton* L. (Euphorbiaceae) in Australia. *Austrobaileya* 6(3): 349–436. The genus *Croton* L. is revised for Australia. Twenty-seven native species (all shrubs, trees or lianes) are recognised: *C. acronychioides* F.Muell., *C. arnhemicus* Muell.Arg., *C. aridus* P.I.Forst. sp. nov., *C. brachypus* Airy Shaw, *C. byrnesii* Airy Shaw, *C. capitis-york* Airy Shaw, *C. caudatus* Geisel., *C. choristadenius* K.Schum., *C. densivestitus* C.T.White & W.D.Francis, *C. dockrillii* Airy Shaw, *C. habrophyllus* Airy Shaw, *C. insularis* Baill., *C. magneticus* Airy Shaw, *C. mamillatus* P.I.Forst. sp. nov., *C. minimus* P.I.Forst. sp. nov., *C. multicaulis* P.I.Forst. sp. nov., *C. multicaulis* subsp. *velutinus* P.I.Forst. subsp. nov., *C. mutabilis* P.I.Forst. sp. nov., *C. phebalioides* Muell.Arg., *C. rarus* P.I.Forst. sp. nov., *C. schultzii* Benth., *C. simulans* P.I.Forst. sp. nov., *C. stigmatosus* F.Muell., *C. stockeri* (Airy Shaw) Airy Shaw, *C. tomentellus* Airy Shaw, *C. triacros* F.Muell., *C. verreauxii* Muell.Arg. and *C. waterhouseae* P.I.Forst. sp. nov. All apart from *C. caudatus*, *C. choristadenius* and *C. insularis* are endemic. Three naturalised species are recorded: *C. capitatus* Hook., *C. glandulosus* L. and *C. setigerus* Hook., all being small herbaceous weeds. One species (*C. armstrongii* S.Moore) is of dubious origin with the type from Australia but no subsequent collections. An identification key is provided to all thirty-one species. All taxa are described and all native species and subspecies illustrated. Notes are provided on distribution, habitat, typification, affinities and conservation status for each taxon. Lectotypes are selected for the names *C. acronychioides* F.Muell., *C. affinis* Maiden & R.T.Baker, *C. arnhemicus* Muell.Arg., *C. stigmatosus* F.Muell. and *C. triacros* F.Muell. The new combination *Adriana urticoides* (A.Cunn.) Guymer is made for *Croton urticoides* A.Cunn.

Keywords: *Croton* - Australia; *Croton aridus*, *Croton caudatus*, *Croton choristadenius*, *Croton mamillatus*, *Croton minimus*, *Croton multicaulis*, *Croton multicaulis* subsp. *velutinus*, *Croton mutabilis*, *Croton rarus*, *Croton schultzii*, *Croton simulans*, *Croton waterhouseae*, *Adriana urticoides*

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Introduction

The genus *Croton* L. was described by Linnaeus (1753) and thirteen species were named at that time. Since then many species have been included in *Croton*, and although some have since been transferred to other genera, it is estimated that there are between 800 (Webster 1993) and 1200 (Berry 1999) species in the genus. *Croton* is second only to *Euphorbia* L. in number of species within the family.

Croton is included in Euphorbiaceae subfamily Crotonoideae, tribe Crotoneae with the Old World genera *Mildbraedia* Pax, *Moacroton* Croizat and *Paracroton* Miq. (sometimes listed as the invalid *Fahrenheitia* Reichb.f. & Zoll.) (Webster 1994). Occasionally the genera *Crotonopsis* Michx., *Eremocarpus* Benth. and *Julocroton* Mart. are also recognised in this tribe (Radcliffe-Smith 2001), although all three genera were reduced to sections of *Croton* by Webster (1992). *Croton* is distinguished from the other genera in the Crotoneae mainly by the filaments inflexed in the bud and the pistillate petals being reduced or absent (Webster 1994). The Crotoneae is probably derived within the Crotonoideae (Tokuoka & Tobe 1998); however, a comprehensive phylogeny for the group is yet to be proposed.

Species of *Croton* are found throughout the tropics and subtropics in both the Old and New Worlds, or as Hooker (1890) stated "in all hot countries". There are major concentrations of species in the Neotropics (J.Mueller 1873; Webster 1992; Berry 1999), Mexico (Webster 2001), Madagascar (Govaerts *et al.* 2000) and parts of Malesia (Airy Shaw 1980a), but lesser numbers in Africa (Radcliffe-Smith 1996, 1997), continental Asia (Hooker 1890; Chakrabarty & Balakrishnan 1997; Philcox 1997) and Australia (this paper). The last overall monograph of *Croton* was by J.Mueller (1866), and the sheer number of species makes the task of a modern monograph daunting.

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Australia is relatively "depauperate" with twenty-seven native species, three naturalised species and one species of doubtful origin. One species, *Croton armstrongii* S.Moore, is tentatively included, as only the type (there are no subsequent collections) is reputedly of Australian origin, hence it is excluded from most discussion below. The first recording of species for Australia that were referred to the genus *"Croton"* was by Labillardiére (1806) who described *C. quadripartitus* from Tasmania and *C. viscosus* from Western Australia. These taxa are now included in *Adriana* Gaudich. and *Beyeria* Miq. respectively. The first Australian species currently included in *Croton* was *C. verreauxii* described by Baillon (1858), soon followed by additional species in the 1860's (F.Mueller 1864, 1868; J.Mueller 1864, 1865, 1866). Bentham (1873) included nine species in *Croton*, and some additional species and infraspecific taxa were recognised before the revision and conspectus by Airy Shaw (1976, 1980b,c, 1981).

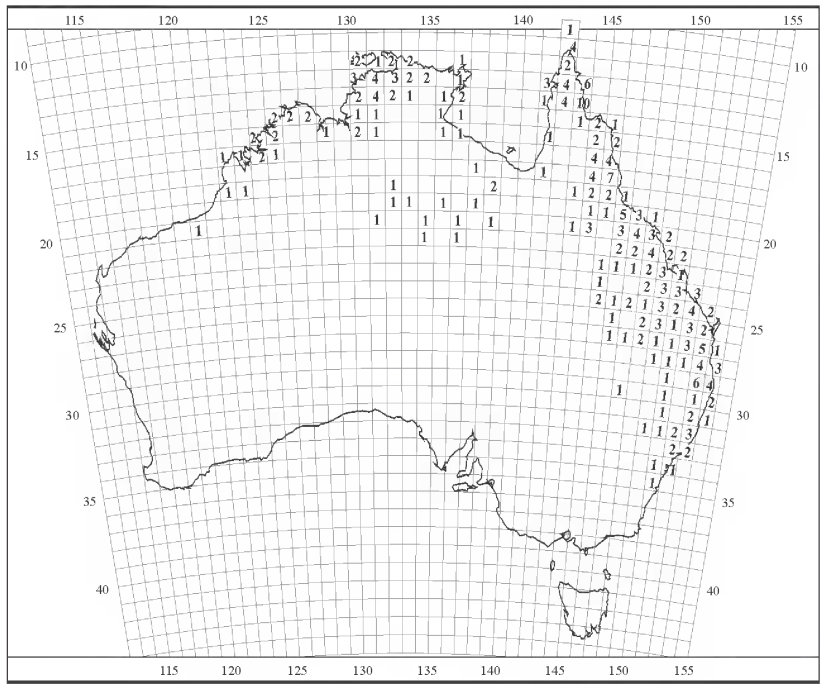
Airy Shaw (1981) recognised nineteen species of *Croton* for Australia, provided a species key, bibliographic details, and notes on distribution and habit. He did not resolve the typification of many species, provide detailed comparative descriptions, or adequately deal with variation in some taxa. In the present account several new taxa are described. Five of these (*Croton mamillatus, C. minimus, C. rarus, C. simulans* and *C. waterhouseae*) are narrow endemics and have been discovered subsequent to Airy Shaw's work or were not seen by him, whereas *C. aridus*, *C. mutabilis* and *C. multicaulis* were included by Airy Shaw within other species. *Croton caudatus* and *C. choristadenius* are newly recorded for Australia and occur also in Malesia. The presence of three species in Australia, notably *Croton argyratus*, *C. cocchymelophyllus* and *C. storckii* is refuted. The three naturalised herbaceous species *Croton capitatus*, *C. glandulosus* and *C. setigerus* are also included in this account.

The Australian species of *Croton* are largely tropical and subtropical in their distribution. The majority of species (twenty-two) occur in rainforest communities (sensu Webb & Tracey 1981, ranging from evergreen notophyll vineforests to deciduous vinethickets), although several taxa grow in woodland communities and one occurs in the arid zone on red sand-hills. Of the twenty-seven native species, all but three are endemic. The non-endemic native species occur elsewhere in Malesia or Melanesia, with two of them (*Croton caudatus* and *C. choristadenius*) known from single localities in far north Queensland. Several species are very widespread (e.g. *Croton arnhemicus, C. insularis* and *C. phebalioides*) and occur over 44–55 1° grid squares (**Map 1**). Six endemic species (*Croton brachypus, C. byrnesii, C. mamillatus, C. simulans, C. stockeri* and *C. waterhouseae* are very restricted in occurrence with distributions in only one or two 1° grid squares. The remaining species fall between these two extremes, with some such as *Croton acronychioides*, *C. habrophyllus* and *C. verreauxii* being also widely distributed (15–24 1° grid squares).

In Australia the McIlwraith Range (grid square 13°S, 142°E) has ten species present (**Map 1**). Lesser centres of diversity (six or seven species present) occur at Iron Range (grid square 12°S, 142°E), the southern part of the 'Wet Tropics' (grid square 17°S, 145°E) and south of Brisbane in, or adjacent to the McPherson Range (grid square 28°S, 152°E) (Map 1). These higher species densities are a reflection of diverse habitats (due to rainfall and altitude gradients, and diverse geology) being present in these grid squares, and this pattern is repeated in many other plant groups in eastern Australia.

At least one of the narrow endemics (*Croton mamillatus*) can be considered as Critically Endangered using the criteria of the IUCN (2001). This category would also apply to the Australian populations of *Croton caudatus* and *C. choristadenius.* Apart from several species that are listed as Vulnerable (*Croton magneticus*) or Rare (*C. brachypus, C. densivestitus* and *C. stockeri*), under Queensland Government legislation, the majority of species are not considered threatened.

Plant habit of Australian Crotons includes small, wiry herbs, (the three naturalised species) shrubs, lianes and small trees. Most of the native Australian species are shrubs, four are trees



Map 1. Distribution of *Croton* (native taxa) in Australia indicating the number of species in each 1° degree grid square.

and one a canopy liane. Some species may be common components in the habitats where they occur, forming dense thickets. A useful field indicator for species of *Croton* (at least in Australia, but also in South Africa, New Guinea and Thailand where I have encountered species) is the colour of the fallen leaves, which are orange. Some of the Australian species are seasonally deciduous (e.g. *Croton mutabilis, C. rarus, C. simulans*) with the mature foliage often being quite dissimilar to the young leaves that are present at flowering. This process of shedding of the old foliage just prior to flowering, followed by a flush of new foliage at the same time as the flowers, seems to be widespread in some groups or species of Euphorbiaceae (e.g. *Drypetes deplanchei* (Brongn. & Gris) Merr. (Forster 1997), *Mallotus surculosus* P.I.Forst. (Forster 1999), *Claoxylon* spp. (Forster unpubl.). Conversely, many Australian Crotons will hold inflorescences in an arrested state of development for months (e.g. *Croton insularis, C. magneticus, C. phebalioides*) until sufficient moisture is available for flower production.

All of the Australian species of *Croton* appear to be monoecious with the flowers in glomerules of one to many flowers. True dioecy is however, relatively widespread in non-Australian taxa (e.g. Decker & Pilson 2000). The Australian species usually have inflorescences with both male and female flowers, the females usually being few and single in the glomerules towards the base, and the males being many and in groups of 1 to many in the glomerules towards the apex. There are generally many more male flowers than female flowers in any inflorescence. It is also not unusual to observe inflorescences where the flowers are all of one sex. In these instances the flowers are usually all male and are being produced during drought. Occasionally both male and female flowers may be present in the same glomerule.

As yet we have little information on the reproductive biology of Australian Crotons. Casual observations of the flowers would tend to indicate that the female flowers towards the base of the inflorescence open first, followed by the males towards the top. In non-Australian

species the ratio between male and female may be related to the age of the plant (Shaanker & Ganeshaiah 1984). This pattern of non-synchronous floral development (or temporal dioecy) seems to be widespread in monoecious Euphorbiaceae and would tend to favour outcrossing (Bawa *et al.* 1982; Freitas *et al.* 2001). In many instances, however, there are both male and female flowers open at the same time in the one inflorescence, and certainly on the one individual. *Croton* flowers seem to be most suitable for bee pollination (Endress 1994) and I have seen hordes of native bees (viz. *Trigona* spp.) working the inflorescences of flowering individuals. Other insects such as various Coleoptera, Hymenoptera and Lepidoptera have also been recorded as pollinators of the Argentinian *Croton sarcopetalus* (Freitas *et al.* 2001), and it is not unreasonable to predict that such broad guilds of insects would also visit the flowers of Australian Crotons. The major reward for such attention is probably both pollen and nectar, and the small male flowers of Crotons perfectly fit what Endress (1994) termed as 'bowl' flowers that are mainly visited by diverse insects with short proboscises. Small ants are also common visitors to the flowers, and although they probably mainly act as pollen and nectar robbers, it is possible that they are more than incidental in pollination efficiency. Interestingly enough, for the herbaceous *Croton suberosus* H.B.K. from Mexico, it has been found that floral nectar seems mainly to attract ants that act as herbivore predators, rather than as pollinators (Dominguez *et al.* 1989).

Nearly all of the Australian Crotons have noticeable extrafloral nectaries at the base of the leaf lamina or distant end of the petiole and their role as sources of attraction to ants or other insects is unknown, although they do secrete small amounts of nectar (Jose & Inamdar 1989; Freitas *et al.* 2000, 2001). Certainly the position and gross morphological form of these organs have proved useful as taxonomic characters in the current account.

As with many Euphorbiaceae, in *Croton* the fruit are capsular and dehiscent. The presence of a fleshy caruncle on the seeds undoubtedly make them attractive to ants that may subsequently aid in dispersal. In the Indian *Croton bonplandianus* Baill. the female flowers bear nectar glands that only become active during fruit maturation and attract ants that may subsequently disperse the seeds (Ganeshaiah & Shaanker 1988). Whether this phenomenon is widespread in the genus is unknown. Likewise the presence and form of these nectaries in most species of *Croton* is unknown, but it is likely that further useful taxonomic characters could be found from their study.

Groupings of taxa

Webster (1993a) has proposed a new classification of *Croton* with forty sections. In the present account I have not followed his classification that is based mainly on New World taxa. Instead the Australian species are listed alphabetically. Some Australian species (e.g. *Croton stockeri*, *C. arnhemicus*) appear to have combinations of characters that transgress Webster's sections, many of which appear to be artificial and do not correlate with some of the New World taxa included. Nevertheless a number of groups in native Australian *Croton* can be inferred on the basis of morphology.

Group 1.

Lianes. Included species: *C. caudatus*.

Group 2.

Shrubs or trees. Foliage penninerved, not silver-white below, indumentum generally of scattered trichomes. Included species: *Croton acronychioides*, *C. brachypus*, *C. byrnesii*, *C. choristadenius*, *C. dockrillii*, *C. habrophyllus*, *C. mutabilis*, *C. rarus*, *C. triacros*, *C. verreauxii*.

Group 3.

Shrubs or trees. Foliage palminerved, not silver-white below, indumentum of dense trichomes (pubescent to velutinous). Included species: *Croton aridus*, *C. armstrongii*, *C. arnhemicus*, *C. minimus*, *C. multicaulis*, *C. waterhouseae*.

Group 4.

Shrubs. Foliage penninerved, not silver-white below, indumentum of dense trichomes (pubescent to velutinous). Included species: *Croton densivestitus*, *C. magneticus*, *C. stockeri*.

Group 5.

Shrubs or trees. Foliage penninerved, silver-white below, indumentum of dense adpressed trichomes. Included species: *Croton capitis-york, C. insularis, C. mamillatus, C. phebalioides, C. simulans, C. stigmatosus.*

Group 6.

Shrubs or trees. Foliage palminerved, silver-white below, indumentum of dense adpressed trichomes. Included species: *Croton schultzii, C. tomentellus.*

Materials and Methods

This revision is based on herbarium holdings at AD, BRI, CANB (including CBG), DNA, MEL, NSW, PERTH and QRS, selected type material at BM and BO, photographs or microfiche of types at BM, G-DC, K and P, and field collections and observations by the author. In some instances, where there is a paucity of Australian collections for a particular taxon (e.g. *Croton capitatus*, *C. caudatus*, *C. choristadenius*, *C. glandulosus* and *C. setigerus*), selected non-Australian collections have also been cited and used in formulating the descriptions.

Species are defined as groups of populations (1-many) with discontinuities in two or more independent character states of morphology. Where a single character state difference is present and the discontinuity is geographically based, the rank of subspecies is used. This is a species definition that is widely used and understood (Stebbins 1950; Cronquist 1988) but would equate to the 'diagnostic species concept' of Judd *et al.* (2002). Characters most commonly used in the identification key are those of habit, indumentum type (**Fig. 1**), leaf lamina venation and marginal teeth number, extrafloral nectaries (position and form), stem stipules, flowers (particularly stamen number) and fruit shape. Collectors should ensure that at least both male and female flowers are collected when making specimens of Crotons.

Invariably my species concept is closely tied to habitat preferences and geographic distribution and has been largely arrived at from extensive fieldwork in northern Australia, particularly Queensland where twenty-four species are found. I have been fortunate to study twenty-four of the twenty-seven native species in the field.

Floral descriptions were prepared from material preserved in spirit (FAA or 70% alcohol and glycerol) or reconstituted by boiling in water and detergent. Fruit descriptions were prepared from spirit and dried material. Foliage, inflorescence and seed descriptions were prepared from dried material.

Indumentum cover is described using the terminology of Hewson (1988), except that 'scattered' is used instead of 'isolated'. Indumentum in Australian *Croton* species comprises multicellular, simple trichomes or compound trichomes (**Fig. 1**). The compound trichomes include sessile stellate trichomes, stalked stellate trichomes, peltate trichomes and peltate scales (lepidote). Peltate scales and stellate or peltate trichomes are usually sessile rather than stalked. Where no indication is given in the descriptions, it may be assumed that they are sessile. A system for trichome morphology in *Croton* has been proposed by Webster *et al.* (1996), but this has not been followed here, mainly because the trichome types in Australian crotons are not as diverse as the 120 species that they studied. The fruit of *Croton* species commonly have sessile and/or stalked trichomes, or rarely on a fleshy mamillate protuberance (*C. capitis-york, C. mamillatus, C. stigmatosus*), hence it is always specified as to the condition present.

The term 'foliar glands' is included in the descriptions and this refers to the small glands that are present at the apices of any teeth on the leaf lamina margins. If these foliar glands are stated to be 'prominent' this means that they are discernible with the naked eye. 'Inconspicuous' means that they are only discernible with a microscope. Most of the native Australian Crotons have extrafloral nectaries (Jose & Inamdar 1989; Freitas *et al.* 2000, 2001) at, or near to the base of the leaf lamina; these may be referred to as 'glands' in other works or keys.

Common abbreviations in the specimen citations are N.P. or N.P.R. (National Park), L.A. (Logging Area), S.F. or S.F.R. (State Forest or State Forest Reserve) and T.R. (Timber Reserve). Rainforest terminology follows Webb (1978).

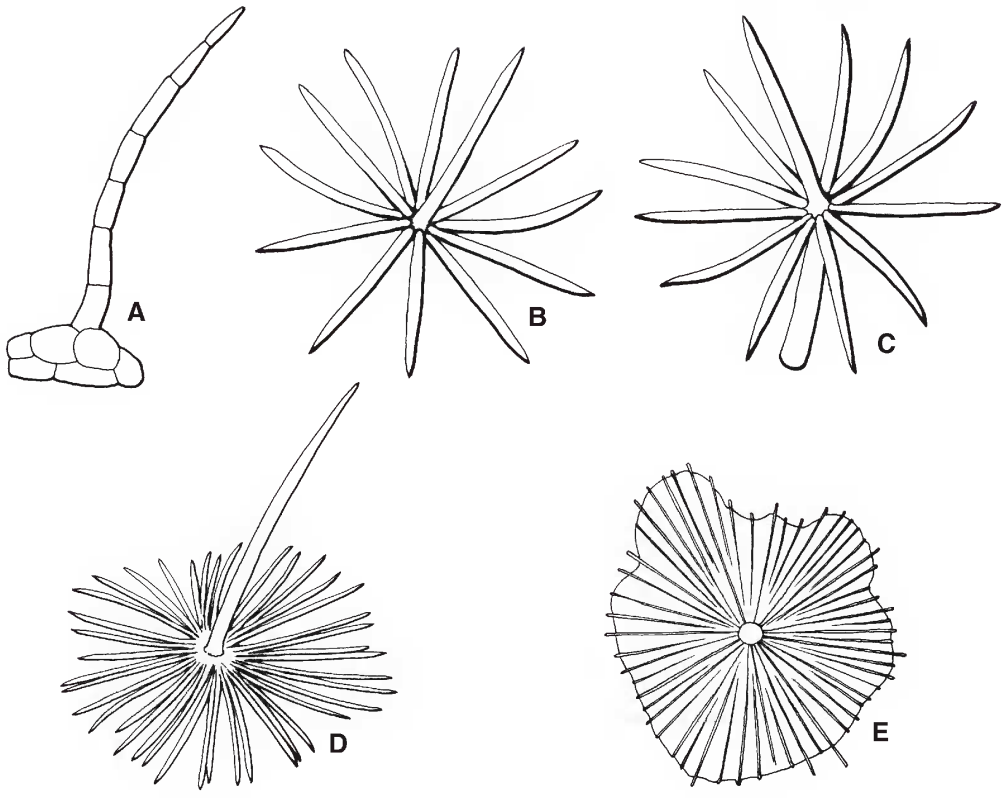


Fig. 1. Trichome types in Australian *Croton*. A. simple multicellular trichome. B. sessile stellate trichome. C. stalked stellate trichome. D. peltate trichome. E. peltate scale. Del. W. Smith.

The 'Wet Tropics' is defined as that area of north-eastern Queensland which encompasses the 'hot, humid vine forests' from near Cooktown in the north to Paluma in the south (Webb & Tracey 1981; Barlow & Hyland 1988). Conservation codings follow those that are listed in Queensland legislation, and are derived from those proposed by the IUCN (Anonymous 2001).

The taxa are mapped in 1° grid squares. This has enabled information to be gathered about centres of species richness and the restriction or otherwise of the individual taxa.

Taxonomy

Croton L., Sp. Pl. 1004 (1753). **Type:** *Croton tiglium* L. (lectotype chosen by Small 1913).

Derivation of name: From the Greek *kroton* (a tick), apparently a fanciful allusion to the 'tick-like' seeds.

Generic synonymy is listed in Webster (1994) and Radcliffe-Smith (2001); however, none of these names have been applied to Australian taxa so they are not repeated here. The following generic description is meant to be comprehensive for the taxa in Australia, but will also be largely applicable for the genus elsewhere.

Herbs, lianes, shrubs or small trees, annual or perennial, monoecious or dioecious, evergreen or deciduous; stems and foliage without latex. Indumentum of simple or compound trichomes and scales in various combinations, glandular trichomes absent,

stinging trichomes absent. Stipules entire or lobed, generally inconspicuous, deciduous. Leaves alternate to subopposite, sessile to petiolate, simple and usually elobate, palmi- or penninerved, entire or denticulate to crenate, often with sessile or stipitate glands at lamina base or on petiole. Inflorescences terminal or axillary, racemose or spicate, solitary, uni- or bisexual and androgynous, with flowers in bracteate glomerules. Male flowers sessile to pedicellate; calyx lobes 4–6, imbricate or valvate, ± equal; petals 4–6, free, usually shorter than sepals; stamens 5–50 (–100 plus), filaments free and attached to a slightly raised pilose receptacle, inflexed in bud, filiform or flattened; anthers dorsifixed, bilobate, thecae oblong and longitudinally dehiscent; pistillodes absent. Female flowers sessile to pedicellate; calyx lobes (0–) 4–6 (–8), imbricate or valvate; petals usually absent; disk annular, or of separate glands or absent; ovary 1–3(4)-locular, locules uniovulate; styles shortly connate at base, bifid to multifid. Fruits capsular, uni-, bi- or trilobate, surface smooth and variously pubescent, dehiscing septicidally into bivalved cocci, or rarely indehiscent. Seeds ovoid, obloid, ellipsoid or subglobose; testa crustaceous to woody; albumen fleshy; caruncles entire, non-arilloid; cotyledons broad, flat.

Over 800 species in the tropics and subtropics. Thirty-one species in Australia, with three naturalised and twenty-seven native species with twenty-two being endemic. One species is of dubious origin.

Webster (1967) chose to retypify *Croton* with *C. aromaticus* L. as the lectotype species, but this does not supersede the lectotypification of Small (1913) with *C. tiglium* L. and the status quo is maintained by Radcliffe-Smith (2001) and here.

Key to the Australian species of *Croton*

1. Herbs 2
   Lianes, shrubs or trees 4

2. Styles 1; fruits unilobate . . . . . **24. C. setigerus**
   Styles 3; fruits trilobate 3

3. Extrafloral nectaries 2 at top of petiole . . . . . **13. C. glandulosus**
   Extrafloral nectaries absent from leaf . . . . . **7. C. capitatus**

4. Lianes . . . . . **9. C. caudatus**
   Shrubs or trees 5

5. Leaf lamina palminerved 6
   Leaf lamina penninerved 13

6. Leaf lamina silver-white below 7
   Leaf lamina green below (not silver-white) 8

7. Stipules linear-lanceolate, 3–6 mm long; leaf lamina below with dense overlapping peltate scales . . . . . **23. C. schultzii**
   Stipules lanceolate, 1.2–1.8 mm long; leaf lamina below with dense stellate trichomes . . . . . **28. C. tomentellus**

8. Leaf lamina denticulate to crenate with 60–100 teeth . . . . . **4. C. arnhemicus**
   Leaf lamina denticulate to crenate with 30–52 teeth 9

9. Stipules lanceolate, 0.3–1 mm long . . . . . **3. C. armstrongii**
   Stipules linear to linear-lanceolate, 1.2–6 mm long 10

10. Leaf lamina with interlateral tertiary venation obscure below ..... **18. C. minimus**
Leaf lamina with interlateral tertiary venation well developed below 11

11. Leaf lamina with 32–40 teeth; male flowers with pedicels 10–12 mm long; stamens 32–38 ..... **31. C. waterhouseae**
Leaf lamina with 10–28 teeth; male flowers with pedicels 1.5–7 mm long; stamens 10–24 12

12. Male flower petals 4–4.5 mm long, 0.8–1 mm wide; fruit oblong-ovoid, 3–17 mm long; seed 8.5–10.5 mm long ..... **2. C. aridus**
Male flower petals 1.5–3.2 mm long, 0.5–1.5 mm wide; fruit depressed-globose, 5–8 mm long; seed 4–5 mm long ..... **19. C. multicaulis**

13. Foliage silver-white to silver-green below due to presence of dense adpressed silver scales and trichomes 14
Foliage green to ferruginous below due to the absence of indumentum or the presence of uncoloured or ferruginous indumentum 19

14. Leaf lamina with obscure lateral venation ..... **15. C. insularis**
Leaf lamina with discernible lateral venation 15

15. Branchlets with peltate scales only ..... **8. C. capitis-york**
Branchlets with stellate trichomes, or with admixture of stellate trichomes and peltate scales 16

16. Branchlets with stellate trichomes only 17
Branchlets with either peltate trichomes, or an admixture of peltate scales and stellate trichomes 18

17. Leaf lamina with the lateral veins not prominently raised below; extrafloral nectaries sessile, visible above only ..... **21. C. phebalioides**
Leaf lamina with the lateral veins prominently raised below; extrafloral nectaries stipitate to 1.8 mm long, visible above & below ..... **26. C. stigmatosus**

18. Branchlets and leaf petioles with peltate trichomes only; extrafloral nectaries absent or circular ..... **17. C. mamillatus**
Branchlets and leaf petioles with admixture of peltate scales and stellate trichomes; extrafloral nectaries ellipsoid ..... **25. C. simulans**

19. Leaf lamina below with indumentum of peltate scales or peltate trichomes 20
Leaf lamina below with indumentum of stellate trichomes 23

20. Leaf petioles 2–5 mm long; lamina narrow-ovate, oblanceolate or obovate, margins entire to sinuate ..... **5. C. brachypus**
Leaf petioles 4–36 mm long; lamina elliptic, lanceolate or ovate, margins denticulate to weakly crenate with 4–34 teeth per side of midrib 21

21. Extrafloral nectaries stipitate ..... **30. C. verreauxii**
Extrafloral nectaries sessile 22

22. Stipules 0.5–1 mm long; extrafloral nectaries 0.8–1.2 mm long; leaf lamina below with scattered peltate trichomes ..... **10. C. choristadenius**
Stipules 1–4 mm long; extrafloral nectaries 0.4–0.6 mm long; leaf lamina below with scattered peltate scales ..... **1. C. acronychioides**

23. Leaf lamina with dense velutinous indumentum below 24
Leaf lamina with scattered to sparse indumentum below 26

24. Leaf indumentum yellow; extrafloral nectaries stipitate ..... **11. C. densivestitus**
Leaf indumentum orange-brown or ferruginous-silver; extrafloral nectaries sessile 25

25. Leaf indumentum orange-brown; stipules lanceolate, 3–6 mm long; inflorescence bracts linear-lanceolate ..... **27. C. stockeri**
Leaf indumentum ferruginous-silver; stipules subulate, 0.3–0.9 mm long; inflorescence bracts lanceolate to oblanceolate ..... **16. C. magneticus**

26. Leaf lamina with 70–112 teeth ..... **14. C. habrophyllus**
Leaf lamina with 18–64 teeth 27

27. Leaf indumentum uncoloured to silver 28
Leaf indumentum ferruginous to yellow 29

28. Leaf lamina with 40–56 teeth, extrafloral nectaries stipitate; fruits globose, c. 4 mm long and 4 mm diameter ..... **12. C. dockrillii**
Leaf lamina with 18–34 teeth, extrafloral nectaries sessile; fruits depressed-globose, 4–5 mm long, 6–7 mm diameter ..... **20. C. mutabilis**

29. Stipules lanceolate, 4–4.5 mm long; male flower sepals 1.6–2 mm long ..... **29. C. triacros**
Stipules linear to linear-lanceolate, 0.7–3.9 mm long; male flower sepals 2–2.5 mm long 30

30. Male flower pedicels 1–2 mm long, sepals obovate; styles bifid; fruits globose, 4–5 mm long, 4–4.5 mm diameter ..... **22. C. rarus**
Male flower pedicels 2.5–7 mm long, sepals ovate; styles multifid, divided twice; fruits depressed-globose, 4.5–5 mm long, 6–7 mm diameter ..... **6. C. byrnesii**

1. Croton acronychioides F.Muell., Fragm. 4:142 (1864) ('acronychoides'). **Type:** Queensland. Port Curtis District: [label 1 in unidentified hand] "A handsome shrub 14 or 15 feet high growing in the scrub nr Rockhampton" [label 2 in F.Mueller hand] "Rockhampton *Bowman*" (lecto [here chosen]: MEL231235).

Croton affinis Maiden & R.T.Baker, Proc. Linn. Soc. New South Wales, II, 9: 160, t. 12 (1894). **Type:** New South Wales. near Tintenbar, August 1893, *W. Baeuerlen s.n.* (lecto [here chosen]: NSW273894).

***Illustrations*:** Floyd (1989: 141); James & Harden (1990: 419); Hauser (1992: 180).

Shrub to 5 m high, monoecious, evergreen, perennial. Indumentum ferruginous-yellow. Branchlets rounded, with scattered to sparse peltate trichomes and scales when young, glabrescent. Stipules lanceolate, 1–4 mm long, 0.3–0.8 mm wide, entire and with dense peltate scales. Leaves alternate, petiolate, discolorous; petioles 4–13 mm long, 0.5–1 mm wide, with dense peltate scales when young, glabrescent; lamina elliptic to ovate, 20–140 mm long, 10–60 mm wide, penninerved with 8–14 lateral veins each side of midrib, tertiary reticulate veins obscure; upper surface glossy green, lateral veins weakly visible, with scattered peltate scales when young, glabrescent; lower surface matt green, lateral veins prominent, with scattered and ± persistent peltate scales, neither scabrous or velutinous; margins denticulate to weakly crenate with 12–26 teeth up to 0.3 mm long, foliar glands prominent; tip acute, obcordate or retuse; base cuneate; extrafloral nectaries 2 at base, sessile, circular to elliptic, 0.4–0.6 mm long, 0.3–0.4 mm wide, visible above and below. Inflorescence up to 40 mm long,

unbranched, often unisexual but occasionally bisexual and androgynous, pedunculate up to 10 mm; axis with sparse to dense peltate scales; bracts lanceolate, 0.5–1 mm long, 0.2–0.3 mm wide, with sparse to dense peltate trichomes. Male flowers 2.8–3 mm long, 3.5–5 mm diameter, held singly on inflorescence, spaced up to 2 mm apart; pedicels 2–3.7 mm long, 0.3–0.5 mm wide, with scattered peltate trichomes at base or glabrous; sepals valvate, 5, lanceolate-ovate, 1.8–2.3 mm long, 1.2–1.6 mm wide, glabrous or lanate in upper half; petals 5, lanceolate to lanceolate-ovate, 2–2.8 mm long, 0.9–1.3 mm wide, lanate in upper half; stamens 6, filaments ± flattened, 1.8–2 mm long, 0.4–0.6 mm wide, with dense simple trichomes at base, anthers oblong, 0.7–1.1 mm long, 0.7–0.9 mm wide. Female flowers 3–3.5 mm long, 3–5 mm diameter, held singly and spaced up to 5 mm apart; pedicels 1.5–4 mm long, c. 1 mm diameter, with sparse peltate trichomes; sepals valvate, 5, lanceolate, 2–3 mm long, 0.5–1.5 mm wide, glabrous or with scattered marginal cilia; petals absent; styles 3, linear to obloid, up to 2 mm long, bifid once for up to 1.5 mm long, connate at base for c. 0.4 mm, glabrous; ovary 3-locular, 2.3–2.5 mm long, 2.3–2.5 mm diameter, with dense, sessile peltate scales. Fruits trilobate, globose, 7–9 mm long, 6–8 mm diameter, with sparse, sessile peltate scales. Seeds ± obloid, 6–6.8 mm long, 3.5–4.5 mm wide, 2.7–3 mm thick, pale brown to glossy dark brown, adaxial surface bifacial, abaxial surface rounded, micropylar ridge 3.5–5 mm long; caruncle crescent shaped, 1–1.5 mm long, 1.5–1.8 mm wide, cream-yellow. **Fig. 2.**

***Selected additional specimens*: Queensland.** North Kennedy District: Cromarty, ridge above Bruce Highway in Bowling Green Bay N.P., 19°28'S, 147°53'E, Jan 1993, *Forster* PIF12748 & *Bean* (BRI). South Kennedy District: S.F. 658 Carawatha, 20°47'S, 148°34'E, Apr 1991, *Forster* PIF8190 & *McDonald* (BRI, K, L, MEL, QRS). Leichhardt District: Melaleuca Creek Scrub, "Rookwood", 23°12'S, 149°46'E, Apr 1991, *Forster* PIF7953 & *McDonald* (BRI, K, L, MEL, QRS). Port Curtis District: Yaparabah, 10 km SSE of Mardale, 24°39'S, 150°42'E, Dec 1982, *Forster* PIF1481 & *Marshall* (BRI); S.F. 53, Dan Dan Scrub, Dec 1987, *Gibson* 1006 (BRI, NSW); Mt Archer road, 23°21'S, 150°35'E, Nov 1986, *Hoy* 129 (BRI); Mt Etna, 23°10'S, 150°27'E, May 1990, *Vavryn* 101 (BRI). Burnett District: Scientific Area 33, Coominglah S.F. 28, 24°54'S, 151°00'E, Apr 1990, *Forster* PIF6696 (BRI, MEL, QRS); Sanderson's Scrub, Mt Blandy, 4 km W of Mingo Crossing, 25°24'S, 151°44'E, Mar 1999, *Forster* PIF24148 & *Booth* (BRI, QRS); S.F. 695 Kalpowar, Burnett Range road, 24°40'S, 151°21'E, Mar 2000, *Forster* PIF25415 & *Booth* (BRI, K, L, MEL, QRS). Wide Bay District: 1 km SW of Booyal, 25°13'S, 152°02'E, Nov 1987, *Forster* PIF3287 (BRI); Oakview S.F. 220 Malmaison, 12 km ESE of Kilkivan, 26°08'S, 152°20'E, Dec 2002, *Forster* PIF29213 (A, BRI, L, MEL, NSW, WIS); Black Gin Creek, T.R. 580, 25°29'S, 151°55'E, Apr 1990, *Forster* PIF6601 (BRI, CBG, MEL, QRS); Fairlies Knob N.P., 25°30'S, 152°17'E, Dec 1992, *Forster* PIF12593 & *Smyrell* (BRI, MEL, QRS). Darling Downs District: S.F.197 Diamondy, Craig Range, 32 km NE of Jandowae, 26°35'S, 151°20'E, Mar 1999, *Forster* PIF24094 & *Booth* (BRI, QRS). Moreton District: Pullen Creek, Moggill S.F., Feb 1980, *Bird* [AQ331172] (BRI); Commissioner's View, Blackbutt Range, 26°52'S, 152°13'E, Nov 1987, *Forster* PIF3251 & *Bird* (BRI, NSW, SAN, SAR). **New South Wales.** Wiangaree S.F., Jan 1981, *Bird* [AQ345019] (BRI); Oxley River (Middle Arm Creek), just beyond end of Butler's Road, NW of Tyalgum, 29°19'S, 153°09'E, Jul 1981, *Guymer* 1585 & *Jessup* (BRI); 23 km NW of Kyogle, Toonumbar Forest Road, Toonumbar S.F., 28°29'S, 152°48'E, Dec 1991, *Halford* Q823 (BRI, MEL, NSW).

***Distribution and habitat*:** *Croton acronychioides* is widespread in south-eastern Queensland and north-eastern New South Wales, but is present in only a few populations in the South Kennedy and North Kennedy districts (**Map 3**). The species has been recorded from a total of seventeen 1° squares. Plants grow in microphyll to notophyll vineforests on a variety of volcanic substrates and may be sympatric with *C. insularis* and *C. phebalioides*.

***Phenology*:** Flowering occurs from November to May and commences after storm rain. Fruiting occurs from November to August.

***Notes*:** F.Mueller (1864) cited two elements in the protologue of *Croton acronychioides*, one collected at Fitzroy River by Thozet and the other collected at Broad Sound by Bowman. There are three sheets at MEL (MEL231221, 231235, 231233) that are possible syntypes. MEL231221 is sterile and MEL231233 has two conflicting dates ("155/62" and "166/62") indicating a mixed collection. MEL231235 is fertile, but lacks a date and the locality of Broad Sound or Fitzroy River. The labels do indicate that MEL231235 was collected by Bowman near Rockhampton. Mueller (1864) definitely described a fertile plant, hence a lectotype is chosen from MEL231235 as it fulfills more criteria to qualify as a syntype of the name than do the other contenders.

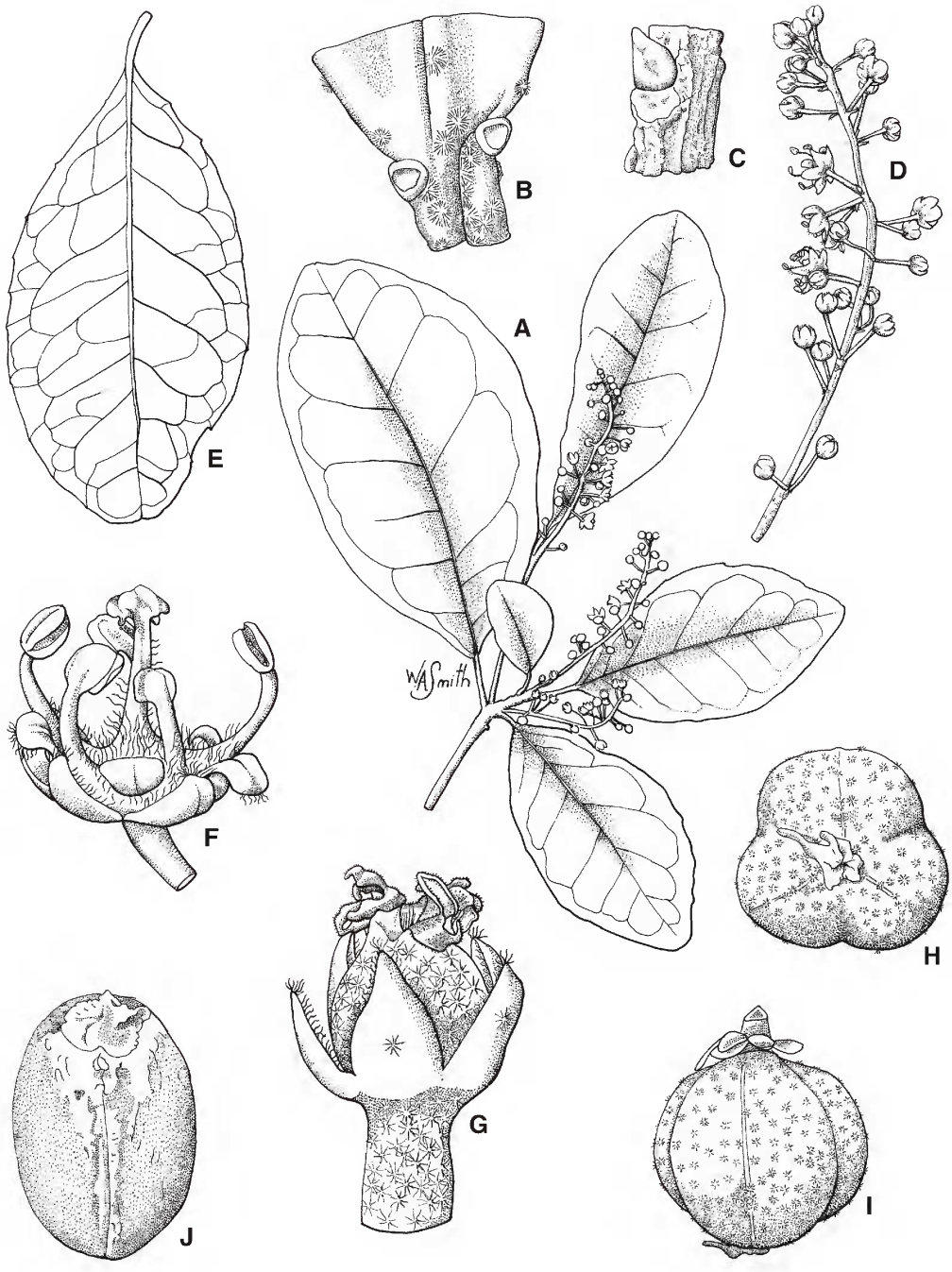


Fig. 2. ***Croton acronychioides***. A. flowering branchlet. × 0.8. B. base of leaf lamina showing extrafloral nectaries. × 16. C. node with stipule. × 4. D. inflorescence with male flowers. × 2. E. undersurface of leaf. × 1. F. male flower (lacking one stamen). × 8. G. female flower. × 8. H & I. fruits. × 4. J. seed. × 6. A, B, D from *Forster* PIF3251 (BRI); C & G. from *Forster* PIF12616 (BRI); E, H–J from *Forster* PIF3287 (BRI); F from *Forster* PIF12593 (BRI). Del. W. Smith.

There are three specimens that may be considered as candidates for a type of *Croton affinis* because they were all collected at Tintenbar by Baeuerlen. There are two at NSW, NSW273959 and NSW273894, only the latter has a date - Feb 1894. There is also one specimen at MEL dated Aug 1893. A lectotype is selected from the Feb 1894 specimen at NSW as this would appear to predate the publication of the name.

***Conservation status*:** Widespread and common, but infrequent and usually disjunct in the northern parts of its range. Present in at least 20 conservation reserves in south-eastern Queensland alone (Forster *et al.* 1991).

***Etymology*:** The specific epithet probably refers to a resemblance of the foliage of this plant to that of some species of *Acronychia* (Rutaceae).

2. Croton aridus P.I.Forst., **sp. nov.** affinis *C. arnhemico* Muell.Arg. a qua foliis 20–36–dentatis, fructibus oblongis majoribusque (13–17 × 10–13 mm), et seminibus oblongiovoideis majoribusque (8.5–10.5 mm longis) differt. **Typus:** Northern Territory. c. 130 km S of Tennant Creek on Stuart Highway, 20 July 1968, *J.Z. Weber* 1084A (holo: AD [1 sheet]; iso: BRI, DNA, MEL).

Croton sp. (Barkly Downs S.L.Everist 3379) (Forster & Henderson 1997: 72; Forster & Halford 2002: 70)

Subshrub to 1.5 m high, multistemmed, monoecious, evergreen, perennial. Indumentum silver. Branchlets rounded, with dense stellate trichomes when young, glabrescent. Stipules linear-lanceolate, 3–5 mm long, 0.4–0.6 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 5–15 mm long, c. 1 mm wide, with dense stellate trichomes when young, rarely glabrescent; lamina ovate to broadly ovate, 15–80 mm long, 10–80 mm wide, palminerved with 3–5 veins from base and 6–8 lateral veins per side of midrib further up lamina, tertiary reticulate veins present; upper surface silver-green, venation weakly visible, with dense stellate trichomes when young, becoming sparse with age; lower surface pale silver-green, lateral and reticulate venation prominent, with dense and ± persistent stellate trichomes, velutinous; margins crenate with 10–18 teeth up to 3 mm long, foliar glands prominent; tip obtuse to acute; base cordate to truncate; extrafloral nectaries at lamina base often absent or obscure, if present then 1 or 2 at lamina base, sessile, elliptic, c. 0.3 mm long and 0.2 mm wide, visible below only. Inflorescence up to 40 mm long, unbranched, usually androgynous, often reduced to single female flower, pedunculate up to 5 mm; axis with dense stellate trichomes; bracts linear-lanceolate to lanceolate, 1–2.5 mm long, 0.3–1 mm wide, with dense stellate trichomes. Male flowers 3–4 mm long, 5–6 mm diameter, densely clustered in upper portion of inflorescence; pedicels 6–7 mm long, c. 0.5 mm wide, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate, 3–4 mm long, 1.5–2.5 mm wide, with dense stellate hairs; petals 5, oblanceolate, 4–4.5 mm long, 0.8–1 mm wide, lanate in upper half; stamens 20, filaments ± filiform, 2.2–3 mm long, c. 0.1 mm wide, glabrous; anthers oblong, 0.7–0.8 mm long, 0.6–0.7 mm wide. Female flowers 5–6 mm long, 4–5 mm diameter, held singly and spaced 6 mm apart; pedicels 3–8 mm long, c. 1 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate, 3–3.5 mm long, 1.7–2 mm wide, with dense stellate trichomes; petals absent; styles 3, linear-obloid, up to 3 mm long, bifid once for up to 2.8 mm long, ± free at base, glabrous; ovary 3-locular, c. 3 mm long and 3 mm diameter, with dense, ± sessile stellate trichomes. Fruits trilobate, oblong-ovoid, 13–17 mm long, 10–13 mm diameter, with dense, ± sessile stellate trichomes. Seeds ± obloid, 8.5–10.5 mm long, 7–9 mm wide, 4–6 mm thick, matt brown, ventral surface bifacial or ± rounded, dorsal surface rounded, micropylar ridge 8–8.8 mm long; caruncle ovate, 1.5–mm long, c. 1.8 mm wide, cream. **Fig. 3**.

***Additional specimens*: Western Australia.** Near Edgar Range, SE of Broome, 18°28'S, 123°03'E, Aug 1976, *Kenneally* 5733 (CANB); c. 40 km NE of Callawa Station HSD, E of Shay Gap, 20°26'S, 120°47'E, Aug 1997, *Mitchell* PRP1823 (BRI); 79 km SE of Broome on Dampier Downs road, NW of Edgar Ranges, 18°15'S, 122°45'E, Jul 1989, *White* 150 (PERTH); 9 miles [15 km] N of Bonney Well, Aug 1963, *Winkworth* 1579 (DNA). **Northern Territory.** Barkly Tablelands, Barkly Stock route, 19°52'S, 137°07'E, Mar 1988, *Brock* 375 (DNA); 16 km WSW Soudan, 20°05'S, 136°48'E, Jun 1960, *Chippendale* NT7284 (AD, BRI, CANB, MEL); Barkly Tableland, 40 km WNW

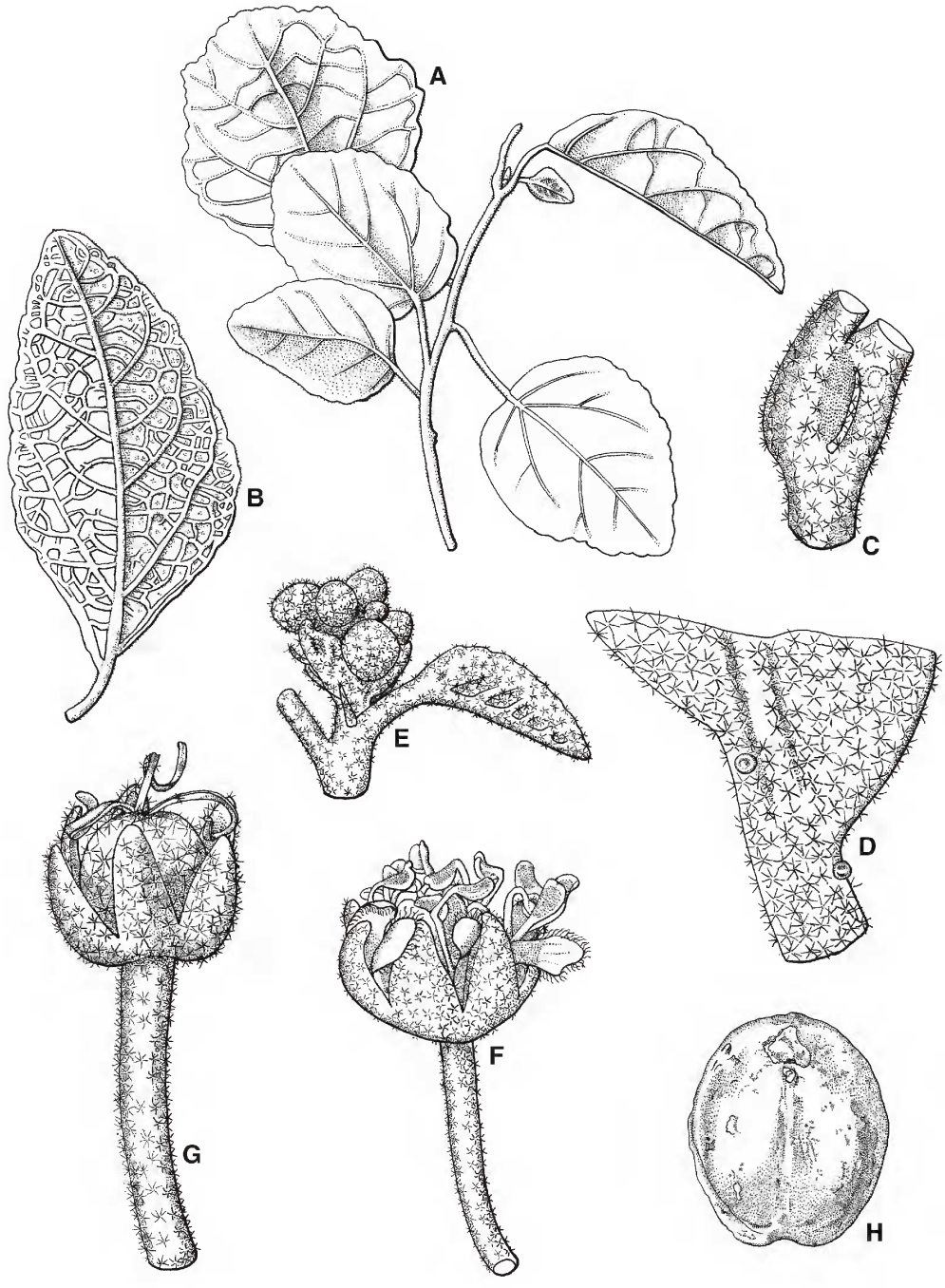


Fig. 3. ***Croton aridus***. A. branchlet. × 1. B. undersurface of leaf. × 1.5. C. node showing stipule. × 6. D. base of leaf lamina showing extrafloral nectaries. × 12. E. node with inflorescence. × 3. F. male flower. × 6. G. female flower. × 6. H. seed. × 3. A–D, H from *Everist* 4243 (BRI); E from *Chippendale* 7284 (BRI); G & F from *Weber* 1084 (BRI). Del. W. Smith.

Frewena, 19°18'S, 135°02'E, Jun 1960, *Chippendale* NT7349 (BRI, CANB, DNA); Singleton, 240 miles [400 km] N of Alice Springs, Jan 1950, *Everist* 4243 (BRI); 98 km N of Annitowa, 20°24'S, 136°50'E, Mar 1981, *Henshall* 3454 (DNA); 10 km S of Wauchope, 20°45'S, 134°15'E, Jul 1977, *Latz* 7511 (AD, DNA); 2 km W of Lake Surprise, 20°13'S, 131°46'E, May 1984, *Latz* 9908 (DNA, PERTH); 2 km W of Lake Surprise, Tanami Desert, 20°12'S, 131°45'E, Jun 1985, *Latz* 10073 (AD, DNA); c. 35 km W of Green Swamp Well No. 4 on road to Lajamanu, 19°14'S, 132°19'E, Sep 1985, *Leach* 815 (DNA); c. 55 km NE of Green Swamp Well No. 4, 18°49'S, 132°54'E, Sep 1986, *Leach* 868 (DNA); 102.5 km W of the Stuart Highway on track to Lajamanu, 19°22'S, 133°20'E, Mar 1988, *Leach* 1708 (DNA); 82 miles [131 km] S of Tennant Creek Jul 1968, *Must* 282 (AD, DNA). **Queensland.** Burke District: Red Sand hills NE of Barkly Downs Homestead, Jul 2002, *Bailey & Kelman* 1 (BRI); Barkly Downs, c. 50 miles [83.3 km] SW of Camooweal, Dec 1947, *Everist* 3379 (BRI, CANB).

***Distribution and habitat*:** *Croton aridus* is widespread in arid central Australia in Western Australia, the Northern Territory and Burke district in Queensland (**Map 2**). The Western Australian populations are markedly disjunct from those in central Australia. Although the species has only been recorded from fourteen 1° squares, it is likely that many further populations will be found. Plants grow on red sand plains or ridges in *Triodia* hummock grasslands, mulga shrublands or open woodland dominated by *Ventilago viminalis*.

***Phenology*:** Flowering occurs sporadically throughout the year following storm rain. Fruits mature two or three months after flowering.

***Notes*:** *Croton aridus* is allied to *C. arnhemicus* and may be a sister-taxon that has adapted to the arid-zone. *Croton aridus* differs most markedly from *C. arnhemicus* in the leaves with 20–36 marginal teeth, the larger (13–17 mm long, 10–13 mm diameter) oblong fruit with larger (8.5–10.5 mm long) oblong-ovoid seed. *Croton arnhemicus* has leaves with 60–100 marginal teeth, globose fruit (6–11 mm long, 7–11 mm diameter) and smaller, obloid to ovoid seeds (4–7 mm long).

***Conservation status*:** *Croton aridus* is widespread and common in its known range.

***Etymology*:** The specific epithet refers to the distribution of this species in arid parts of Australia.

3. Croton armstrongii S.Moore, J. Linn. Soc., Bot. 45: 219 (1920). **Type:** Northern Territory. Port Essington, *Armstrong s.n.* (holo: BM).

Shrub, height unknown, monoecious, ?evergreen or deciduous, perennial. Indumentum uncoloured. Branchlets ± rounded, with scattered stellate trichomes, glabrescent. Stipules lanceolate, 0.3–1 mm long, 0.2–0.3 mm wide, entire and with scattered stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 1–5 mm long, 0.5–0.8 mm wide, with sparse stellate trichomes; lamina ovate, 15–55 mm long, 5–25 mm wide, palminerved with 3–5 lateral veins from base and 5 or 6 lateral veins per side of midrib further up lamina, tertiary reticulate veins poorly developed; upper surface dark green, lateral veins not visible, with scattered stellate trichomes; lower surface pale green, venation weakly developed, with scattered to sparse stellate hairs, neither scabrous nor velutinous; margins crenate with 15–20 teeth 0.5–1.5 mm long, foliar glands prominent; tip acute; base truncate; extrafloral nectaries 1 or 2 at lamina base, subulate, c. 0.6 mm long and 0.2 mm wide, visible above only. Inflorescence up to 50 mm long, unbranched, usually androgynous, pedunculate for up to 2 mm; axis with sparse stellate trichomes; bracts lanceolate, 0.9–1.2 mm long, 0.4–0.5 mm wide, with scattered stellate trichomes. Male flowers c. 2.5 mm long, 3.5–4 mm diameter, densely clustered towards the inflorescence tip; pedicels 1–1.5 mm long, c. 0.2 mm wide, with sparse stellate trichomes; sepals valvate, 5, lanceolate-ovate, 1.8–2 mm long, 1.2–1.3 mm wide, with sparse stellate trichomes; petals 5, oblanceolate, c. 1.6 mm long and 1 mm wide, lanate in upper half and with scattered stellate hairs on backs; stamens 12, filaments ± flattened, 1.4–1.7 mm long and c. 0.1 mm wide, glabrous; anthers oblong, c. 0.8 mm long and 0.6 mm wide. Female flowers c. 3.5 mm long and 5 mm diameter, held singly 1–5 mm apart; pedicels 1.5–2 mm long, 0.7–0.8 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate-obovate, c. 4 mm long and 2 mm wide, with sparse stellate trichomes; petals absent; styles 3, linear, 1.8–2 mm long, multifid, twice divided over 1.4–1.8 mm, connate at base for c. 0.3 mm long, with scattered simple and stellate trichomes; ovary 3-locular, c. 2 mm long

and 2.5 mm diameter, with dense stellate trichomes. Fruits and seeds not seen.

***Specimens examined*:** Known only from the type.

***Distribution and habitat*:** Apparently at Port Essington, Northern Territory (**Map 6**).

***Phenology*:** Unknown.

***Notes*:** *Croton armstrongii* remains an enigma. Airy Shaw (1980) reduced his own *Croton habrophyllus* to synonymy with the earlier name, but did not consult the type specimen of *C. armstrongii* at BM. Wilmot-Dear (1987) subsequently reinstated *Croton habrophyllus* demonstrating that the type of *C. armstrongii* is not conspecific with that of the later name.

The type collection of *Croton armstrongii* was supposedly made at Port Essington. No further collections that are conspecific with the type have been made in the Northern Territory, despite an intensive survey of closed forests by staff of the Northern Territory Conservation Commission in the late 1980s. This may indicate that the taxon is not present in Australia and that the type specimen is incorrectly labelled. There is circumstantial evidence for the BM specimen being incorrectly labelled. An *Armstrong* collection at NSW (NSW270599) that is labelled as *Croton armstrongii*, is conspecific with the type of *C. habrophyllus*. Armstrong also collected in Vanuatu and the Banks Islands (Lanjouw & Stafleau 1954), hence it is possible that the type of *Croton armstrongii* originates from one of these regions. Nevertheless the BM type is of a distinct taxon warranting recognition. Whether the taxon is native to Australia remains to be determined. Until this is resolved there seems little choice but to include the taxon as Australian.

***Conservation status*:** Unknown.

***Etymology*:** Named for Sir Alexander Armstrong (1818–1899) who made plant collections in Melanesia and at Port Essington.

4. Croton arnhemicus Muell.Arg., Linnaea 34: 112 (1865); *Oxydectes arnhemicus* (Muell.Arg.) Kuntze, Rev. Gen. Pl. 2: 611 (1891). **Type:** Queensland. Cape York, *MacGillivray* 514 (lecto [here designated]: K *n.v.*, photo at BRI!); Northern Territory. 'in Arnhemsland Novae-Hollandiae septentrionalis', *F. Mueller* (lectopara: G-DC *n.v.*, fiche at BRI!); Sea Range, towards the Fitzmaurice, October 1855, *F. Mueller* (lectopara: MEL231274 & MEL231258).

Croton arnhemicus var. *urenifolius* Baill., Adansonia 6: 300 (1866). **Type:** Queensland. Port Denison, *E. Fitzalan* (syn: MEL231243, MEL231249 & MEL231251); Edgecombe Height, Aug 1863, *Dallachy* (syn: MEL231246).

Croton arnhemicus var. *typicus* Domin, Biblioth. Bot. 89: 329 (1827), **nom. inval. Type:** same as *C. arnhemicus* Baill.

***Illustrations*:** Brock (1988: 129); Dunlop (1995: 214, fig. 71).

Shrub to 5 m high, monoecious, evergreen, perennial. Indumentum ferruginous-silver. Branchlets rounded, with dense overlapping, stellate trichomes when young, glabrescent. Stipules linear to linear-lanceolate, 1.7–11 mm long, 0.2–0.8 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 3–75 mm long, 0.9–2 mm wide, with dense stellate trichomes when young, rarely glabrescent; lamina elliptic, orbicular, ovate, obovate, 20–240 mm long, 10–200 mm wide, palminerved with 3–5 veins from base and 5–7 lateral veins per side of midrib further up lamina, tertiary reticulate veins present; upper surface grey-green, venation weakly visible, with scattered to sparse stellate trichomes; lower surface ferruginous-silver, lateral and reticulate venation prominent, with sparse to dense, overlapping stellate trichomes, scabrid or velutinous; margins denticulate to weakly crenate with 30–50 teeth up to 2 mm long, foliar glands prominent; tip acute to rounded; base cordate, cuneate, rounded or truncate; extrafloral nectaries 2 at lamina base, sessile or stipitate to 1 mm long, ellipsoid, 0.5–2 mm long, 0.5–1.2 mm wide, visible above and below. Inflorescence up to 200 mm long, unbranched, usually androgynous, pedunculate up to 24 mm; axis with dense stellate trichomes; bracts linear to lanceolate, 0.5–2 mm long, 0.2–0.7 mm wide, with dense stellate trichomes. Male flowers 3.5–6 mm long, 3–7 mm diameter, held singly or rarely in groups

of 2–5 in upper portions of inflorescence; pedicels 1.5–10 mm long, 0.5–1 mm wide, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate to ovate, 2–4.5 mm long, 1–2 mm wide, with sparse to dense stellate hairs; petals 5, oblanceolate to obovate, 2–4.2 mm long, 0.6–2.5 mm wide, lanate in upper half; stamens 20–44, filaments ± filiform, 1.5–4.5 mm long, 0.1–0.2 mm wide, glabrous; anthers oblong, 0.6–1.1 mm long, 0.4–1 mm wide. Female flowers 3–6 mm long, 3.5–6 mm diameter, held singly and spaced up to 20 mm apart; pedicels 1–7 mm long, 0.4–2 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate to ovate, 2.2–3.5 mm long, 1–2.2 mm wide, with dense stellate trichomes; petals absent; styles 3, linear, 1.8–5.5 mm long, bifid for 1.7–5.3 mm, connate at base for c. 0.1 mm, with sparse stellate trichomes; ovary 3-locular, 2–4 mm long, 2–4 mm diameter, with dense, sessile and stalked stellate trichomes. Fruits trilobate, globose, 6–11 mm long, 7–11 mm diameter, with dense, sessile and stalked stellate trichomes. Seeds obloid to ovoid, 4–7 mm long, 3–5 mm wide, 2.2–4 mm thick, brown-black, ventral surface bifacial, dorsal surface rounded, micropylar ridge 3–5 mm long; caruncle ellipsoid-ovate, 0.8–1.5 mm long, 1.3–2.2 mm wide, cream. **Fig. 4**.

***Selected additional specimens*: Northern Territory.** Humpty Doo, 12°32'S, 130°50'E, Sep 1984, *Brock* 19 (DNA); c. 12 miles [20 km] S of Katherine, Jan 1973, *Byrnes 2875* (BRI, CANB, DNA); Stuart Highway, Edith Falls turnoff, 14°15'S, 132°01'E, Dec 1990, *Evans 3476* (BRI, CANB, DNA); Vicinity of El Sharana, Jan 1973, *Martensz & Schodde* AE400 (BRI, CANB); Upper East Alligator River, 13°01'S, 133°25'E, Nov 1987, *Russell-Smith* 4151 & *Lucas* (DNA); 9 km S Koolpinyah Homestead, 12°28'S, 131°10'E, *Russell-Smith* 8126 & *Lucas* (BRI, CANB, DNA). **Queensland.** Cook District: Mt Scatterbrain, Butchers Hill Station near Lakeland, 15°52'S, 144°53'E, Jan 1992, *Forster* PIF9523 (BRI, K, L, MEL, QRS); 13 km past Chillagoe on Mungana road, 17°06'S, 144°24'E, Jan 1992, *Forster* PIF9578 (BRI, DNA, L, MEL, QRS); Mt Eliza, 8 km NW of Mt Surprise, 18°06'S, 144°15'E, Jan 1993, *Forster* PIF12799 (BRI, MEL, QRS); Agate Creek, Robinhood Station, 18°50'S, 143°25'E, Apr 1996, *Forster* PIF19076 *et al.* (BRI); Badu Island, Torres Strait, 10°07'S, 142°07'E, Dec 1979, *Garnett* 253 (BRI); Archer River Crossing on Peninsula Development road, 13°26'S, 142°55'E, Nov 1986, *Jessup* 768 (BRI). North Kennedy District: Harold Island, 20°14'S, 149°09'E, Nov 1985, *Batianoff* 3456 & *Dalliston* (BRI); Turkey Scrub, Whitewater, 18°10'S, 144°38'E, Jan 1993, *Fensham* 343 (BRI); Mingela Bluff, 19°53'S, 146°45'E, Jan 1992, *Forster* PIF9414 & *Bean* (A, B, BRI, DNA, K, L, MEL, MO, NY, QRS); Swamp Bay, Conway Range N.P., 20°16'S, 148°46'E, Jan 1993, *Forster* PIF12738 (BRI, MEL, QRS); Nellie Bay, Dingo Beach, 20°05'S, 148°30'E, Dec 1999, *Forster* PIF25263 & *Booth* (BRI, JE, MEL, QRS); 23 km NNE of Proserpine, 11 km from Bruce Highway on road to Dingo Beach, Box Creek crossing, 20°14'S, 148°31'E, Nov 1991, *Halford* Q671 (BRI, K, MEL, QRS); Mt Inkerman, 12 km S of Home Hill, 19° 46'S, 147°30'E, Mar 1992, *Halford* Q877 (BRI, MEL). SOUTH KENNEDY DISTRICT: on hill above Lake Elphinstone, 21°33'S, 148°14'E, Jan 1978, *Anderson* 271 (BRI); Havilah, 20°58'S, 147°52'E, Dec 1992, *Fensham* 542 (BRI).

***Distribution and habitat*:** *Croton arnhemicus* is widespread in northern Australia in the "Top end" of the Northern Territory and northern Queensland (**Map 2**). This species has been recorded from forty-six 1° grid squares and is undoubtedly the most widespread of the Australian *Croton* taxa. Plants grow in deciduous vinethickets or in open eucalypt woodland on a variety of soil types but predominantly hard laterites or limestone.

***Phenology*:** Flowering and fruiting occurs throughout the year following storm rain. Most flowering records are from the October to February period.

***Notes*:** J. Mueller (1865) listed several syntypes in the protologue of *Croton arnhemicus*. All of these have been located and a lectotype is selected from the best available specimen.

Croton arnhemicus is an extremely variable species in terms of its habit and vegetative morphology. Some variation seen in specimens may be explained by its deciduous habit, resulting in the early flowers of the season often being collected with young foliage. Later flowers and fruit are always collected with older and more mature foliage. Plants in deciduous vinethickets grow into quite large shrubs or small trees up to 6 m in height, whereas those that occur in the eucalypt woodlands in the Northern Territory are often multistemmed due to regular burning back of the above ground parts. These Northern Territory plants develop into small trees if fire is excluded, whereas the allied *Croton multicaulis* P.I.Forst. in Queensland always retains the multistemmed subshrub habit. *Croton arnhemicus* and *C. multicaulis* are superficially similar, and apart from the difference in habit, *C. arnhemicus* has leaves

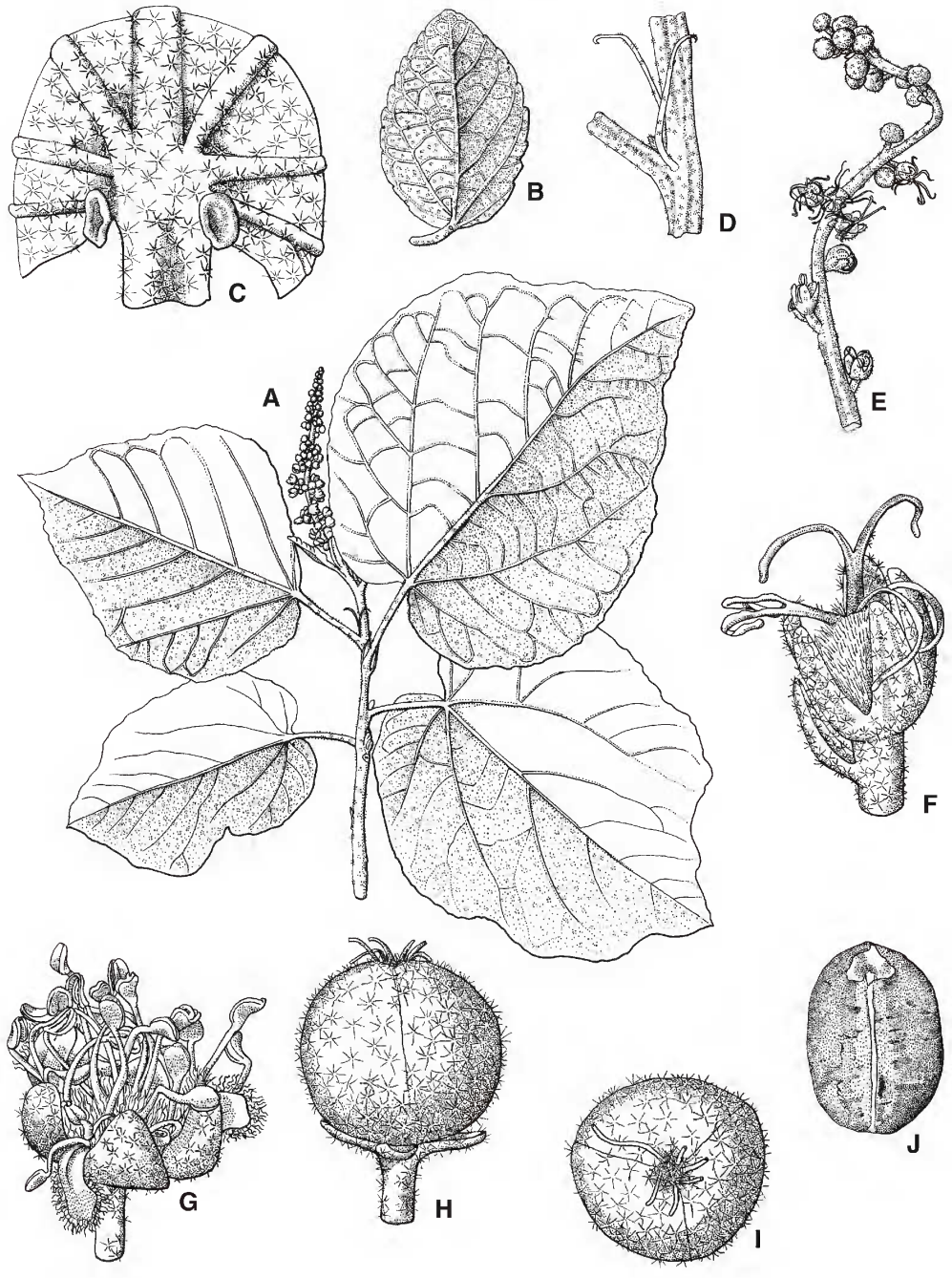


Fig. 4. ***Croton arnhemicus***. A. flowering branchlet. × 0.5. B. undersurface of leaf. × 1. C. base of leaf lamina showing extrafloral nectaries. × 6. D. node showing stipules. × 2. E. inflorescence with female flowers in lower half and male flower buds in upper half. × 1. F. female flower. × 6. G. male flower. × 6. H & I. fruits. × 3. J. seed. × 4. A, C, D from *Champion* 319 (BRI); B, E, F, G from *Forster* PIF9414 (BRI); H–J from *Forster* PIF9523 (BRI). Del. W. Smith.

with 60–100 marginal teeth and male flowers with 20–44 stamens, whereas *C. multicaulis* has leaves with 32–56 marginal teeth and male flowers with 11–24 stamens.

Croton arnhemicus was included in *C.* section *Cascarilla* Griseb. by Webster (1993a), but transgresses the character states for this section in the palmate venation (versus pinnate) and the stamen number.

***Conservation status*:** Very common.

***Etymology*:** The specific epithet alludes to one of the original syntypes being collected in Arnhem Land.

5. Croton brachypus Airy Shaw, Muelleria 4: 224 (1980). **Type:** Queensland. Cook District: Tozer Range, 0.5 mile [0.8 km] east of Mt Tozer, 6 July 1948, *L.J. Brass* 19462 (holo: K *n.v.*; iso: BRI, CANB).

Shrub to 3 m high, monoecious, evergreen, perennial. Indumentum ferruginous. Branchlets rounded, with scattered to sparse peltate scales when young, glabrescent. Stipules linear-lanceolate, c. 1.7 mm long, c. 0.7 mm wide, entire and with sparse peltate scales. Leaves alternate, discolorous, petiolate; petioles 2–5 mm long, 1–1.4 mm wide, with sparse peltate scales; lamina narrow-ovate, oblanceolate or obovate, 18–180 mm long, 12–70 mm wide, penninerved with 7–11 lateral veins per side of midrib, tertiary reticulate veins weakly developed; upper surface matt dark green, venation not visible, glabrous; lower surface pale green, lateral and tertiary reticulate veins weakly developed, glabrous or with scattered peltate scales when young, neither scabrid nor velutinous; margins entire or weakly sinuate, foliar glands prominent; tip acute to shortly acuminate; base cordate to truncate; extrafloral nectaries 2 at lamina base, shortly stipitate to 0.5 mm long, circular, 0.4–0.5 mm long, 0.4–0.5 mm wide, visible below only. Inflorescence up to 65 mm long, unbranched, usually androgynous, pedunculate up to 12 mm; axis with scattered peltate scales; bracts lanceolate, 0.5–0.8 mm long, 0.2–0.3 mm wide, with scattered to sparse peltate scales. Male flowers 2–2.5 mm long, 3.5–4 mm diameter, sparsely to densely clustered on inflorescence; pedicels 2–2.5 mm long, c. 0.4 mm wide, with sparse peltate scales; sepals valvate, 5, lanceolate, 1.5–2 mm long, c. 1 mm wide, lanate in upper half; petals 5, lanceolate, 1.8–2.4 mm long, 0.8–1 mm wide, lanate in upper half; stamens 10–11, filaments filiform, 2.3–2.5 mm long, c. 0.1 mm wide, glabrous or with scattered simple trichomes at base, anthers oblong, c. 0.8 mm long and 0.4 mm wide. Female flowers 3–3.5 mm long, 5–6 mm diameter, held singly and spaced 2–6 mm apart; pedicels 0.8–1 mm long, c. 0.5 mm diameter, with sparse peltate scales; sepals valvate, 5, lanceolate, 1.8–2 mm long, 0.5–0.8 mm wide, with sparse peltate scales; petals absent; styles 3, linear, 2.3–2.5 mm long, bifid for 1.8–2 mm, connate at base for c. 0.6 mm, glabrous; ovary 3-locular, 1–1.3 mm long, 1–1.3 mm diameter, with dense, ± sessile peltate scales. Fruits trilobate, globose, 5–6 mm long, 5–6 mm diameter, with sparse, ± sessile peltate scales. Seeds ovoid, 4–5 mm long, 3–4 mm wide, c. 3.5 mm thick, brown and white blotched, ventral surface bifacial, dorsal surface rounded, micropylar ridge 2.8–3.8 mm long; caruncle obloid, 1.2–1.5 mm long, c. 0.4 mm wide, cream. **Fig. 5.**

***Additional specimens*: Queensland.** Cook District: Tozer Range, north end, Jun 1948, *Brass* 19355 (CANB); Lower northern slopes of Mt Tozer, 12°45'S, 143°15'E, Jun 1972, *Dockrill* 441 (BRI, QRS); Iron Range N.P., 1.3 km NE of Mt Tozer, 12°44'S, 143°13'E, May 1994, *Fell* DGF4083 et al. (BRI); at base of Paps, Tozer Gap, 12°43'S, 14°3°12'E, Jul 1991, *Forster* PIF9093 (BRI, K, L, MEL, QRS); Garraway Creek area, 12°43'S, 143°08'E, Jul 1993, *Forster* PIF13552 & *Tucker* (BRI, K, L, MEL, QRS); ditto, Jul 1994, *Forster* PIF15441 (BRI); Puffdelooney Ridge, 12°45'S, 143°13'E, Jul 1972, *Irvine* 249 (BRI, QRS); 8.3 km E of Garraway Creek on road to Portland Roads, 12°45'S, 143°14'E, Jul 1991, *Neldner* 3538 & *Clarkson* (BRI, DNA, MBA, QRS); Hill E of Mt Tozer, Iron Range area, 12°45'S, 143°13'E, Nov 1977, *Tracey* 14211 (BRI); Mt Tozer near Iron Range, 12°45'S, 143°12'E, Nov 1977, *Tracey* 14849 (BRI).

***Distribution and habitat*:** *Croton brachypus* appears to be endemic to the Iron Range area of northern Cape York Peninsula in Queensland (**Map 3**) and is known from only a single degree square. Plants grow on creek banks or on ridges in notophyll to mesophyll semi-deciduous vineforest on volcanic substrates.

***Phenology*:** Flowering occurs sporadically throughout the year with records in October, November, December, June and July. Fruiting probably occurs two or three months later.

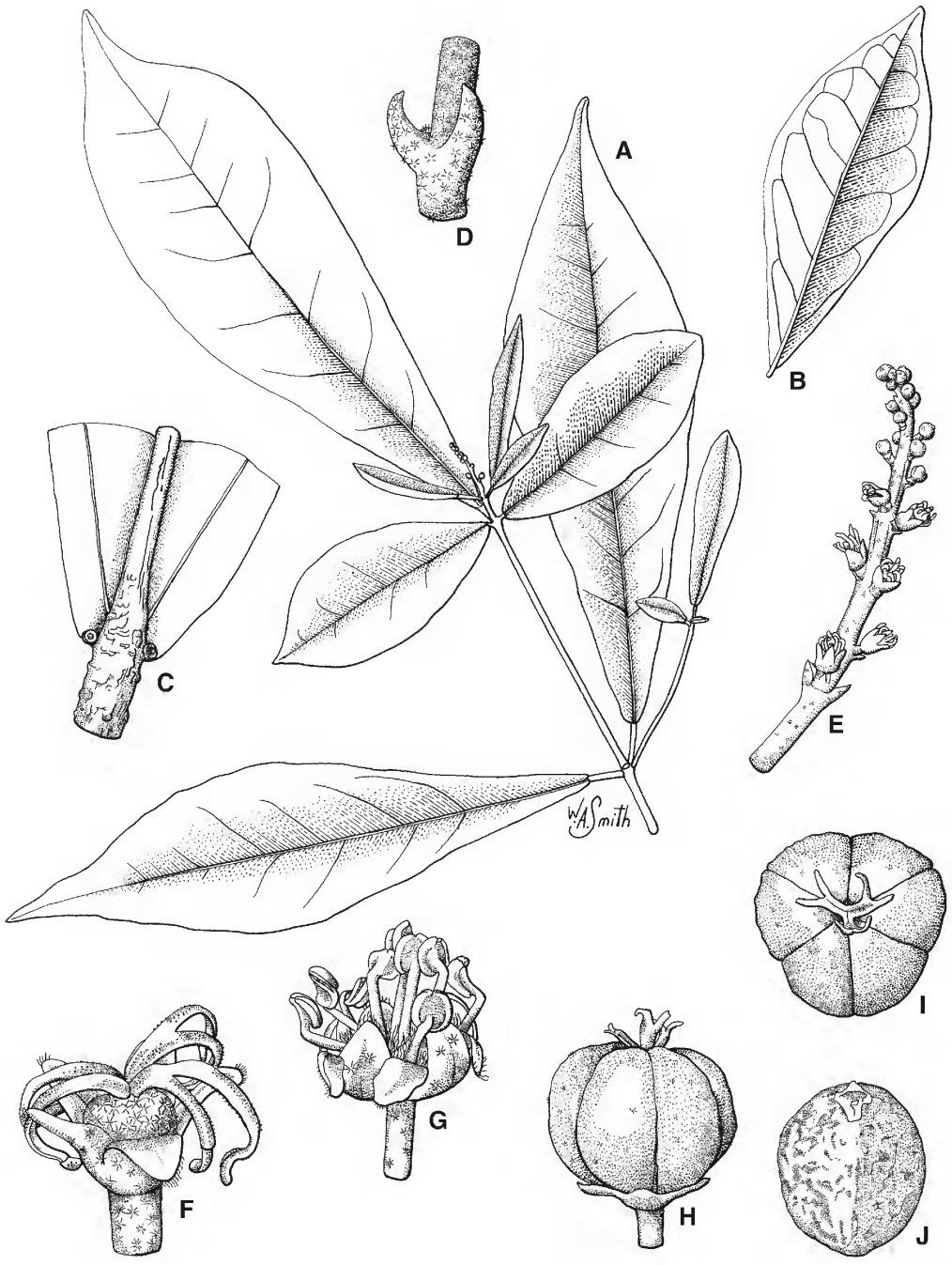


Fig. 5. *Croton brachypus*. A. flowering branchlet. × 0.6. B. undersurface of leaf. × 0.6. C. base of leaf lamina showing extrafloral nectaries. × 4. D. node showing stipules. × 8. E. inflorescence with female flowers towards base and male flowers towards tip. × 2. F. female flower. × 8. G. male flower. × 8. H & I. Fruit. × 4. J. seed. × 6. A–G from *Forster* PIF13552 (BRI); H–J from *Sankowsky* 1445 (BRI). Del. W. Smith.

***Notes*:** *Croton brachypus* is distinctive amongst Australian taxa of *Croton* most notably in the leaves with short petioles.

***Conservation status*:** This species is apparently endemic to a small area of Cape York Peninsula but is locally common. The species is quite common in Iron Range National Park. No conservation coding is thought necessary.

***Etymology*:** The specific epithet is derived from the Greek *brachy* (short) and *-pus* (footed) and presumably alludes to the leaves of this species.

6. Croton byrnesii Airy Shaw, Muelleria 4: 225 (1980). **Type:** Northern Territory. Cannon Hill, 18 December 1972, *N. Byrnes* 2833 (holo: DNA; iso: BRI, CANB; K *n.v.*).

Shrub to 4 m high, monoecious, deciduous, perennial. Indumentum ferruginous to yellow. Branchlets ± rounded, with scattered stellate trichomes when young, glabrescent. Stipules linear, 0.7–2.5 mm long, c. 0.2 mm wide, entire and with scattered stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 10–45 mm long, 0.5–1 mm wide, with sparse stellate trichomes; lamina elliptic, ovate, lanceolate-ovate, 40–170 mm long, 15–90 mm wide, penninerved with 11–13 lateral veins per side of midrib and indistinct tertiary reticulate veins; upper surface dark matt-green, lateral veins weakly visible, glabrous; lower surface pale green, venation weakly developed, with scattered stellate trichomes, neither scabrid nor velutinous; margins crenate with 20–29 short teeth up to 0.5 mm long, foliar glands prominent; tip acute, acuminate; base cuneate, rounded; extrafloral nectaries 2 on petiole 0.4–1 mm below lamina base, sessile or stipitate up to 0.5 mm, ellipsoid, 0.7–1 mm long, 0.5–0.8 mm wide, visible above and below. Inflorescence up to 150 mm long, unbranched, androgynous or with mixed glomerules, pedunculate up to 30 mm; axis with scattered stellate trichomes; bracts lanceolate, 0.8–1.2 mm long, 0.3–0.4 mm wide, with scattered stellate trichomes. Male flowers 2.2–2.5 mm long, 3–4 mm diameter, in dense glomerules of many flowers clustered towards top of inflorescence; pedicels 2.2–4 mm long, 0.4–0.5 mm wide, glabrous or with scattered stellate trichomes; sepals valvate, 5, ovate, 2–2.5 mm long, 1.3–1.5 mm wide, with lanate tip; petals 5, oblanceolate, 2–3 mm long, 0.7–0.8 mm wide, with lanate tip; stamens 9–11, filaments flattened, 1.5–2 mm long, c. 0.2 mm wide, glabrous, anthers oblong, 0.8–1 mm long, c. 0.7 mm wide. Female flowers 3.8–4 mm long, 3.5–3.8 mm diameter, densely clustered with males, sometimes single and up to 15 mm apart; pedicels 2.5–7 mm long, 0.5–0.9 mm diameter, with scattered stellate trichomes; sepals valvate, 5, lanceolate to lanceolate-ovate, 2–3 mm long, 1–2.5 mm wide, with lanate tip; petals absent; styles 3, linear, 1.8–2.7 mm long, multifid, twice divided for 1–1.5 mm, connate at base for 0.2–0.3 mm, glabrous; ovary 3-locular, 1.5–2.3 mm long, 2–2.3 mm diameter, with dense, sessile stellate trichomes. Fruits trilobate, depressed-globose, 4.5–5 mm long, 6–7 mm diameter, with scattered, sessile stellate trichomes. Seeds ± obloid, 3.5–4.5 mm long, 3.2–4 mm wide, 2.5–2.8 mm thick, tan-brown, ventral surface rounded to weakly bifacial, dorsal surface rounded, micropylar ridge 2.3–2.5 mm long; caruncle crescent-shaped, 1–1.5 mm long, 1.7–2.5 mm wide, cream. **Fig. 6.**

***Additional specimens*: Northern Territory.** Cannon Hill, 12°22'S, 132°56'E, Nov 1976, *Airy Shaw* (DNA1079); East Alligator River, 12°29'S, 133°03'E, Feb 1973, *Dunlop* 3235 (DNA); East Alligator River, 12°50'S, 133°22'E, Dec 1989, *Dunlop* 7628 (AD, BRI, CANB, DNA, MEL, NSW) 1 mile [1.7 km] SW Cannon Hill, Feb 1973, *Martensz & Schodde* AE648 (BRI, CANB, DNA); 2.5 miles [4.2 km] N Cannon Hill airstrip, Feb 1973, *Martensz* AE812 (BRI, DNA); 10 km S Cannon Hill, 12°28'S, 132°55'E, Nov 1983, *Russell-Smith* 845 (BRI, CANB, DNA); Upper East Alligator River, 12°49'S, 133°22'E, Oct 1987, *Russell-Smith* 3860 & *Lucas* (BRI, DNA); Upper East Alligator River, Arnhem Land, 12°50'S, 133°20'E, Apr 1988, *Russell-Smith* 5283 & *Lucas* (DNA); 12 km E of Mudginberri Homestead, Kakadu N.P., 12°35'S, 132°59'E, Jan 1991, *Russell-Smith* 8402 & *Brock* (BRI, DNA, MEL).

***Distribution and habitat*:** *Croton byrnesii* is restricted to the headwaters of the Alligator River in Arnhem Land (**Map 4**) where it has been collected from two 1 degree grid squares. Plants grow in fragmented vinethickets, often dominated by *Allosyncarpia ternata* S.T.Blake and *Lophostemon lactifluus* (F.Muell.) Peter G. Wilson & Waterhouse, along streams in sandstone gorges.

***Phenology*:** Flowering occurs from November to April, following storm or wet season rain. Fruiting occurs two or three months later.

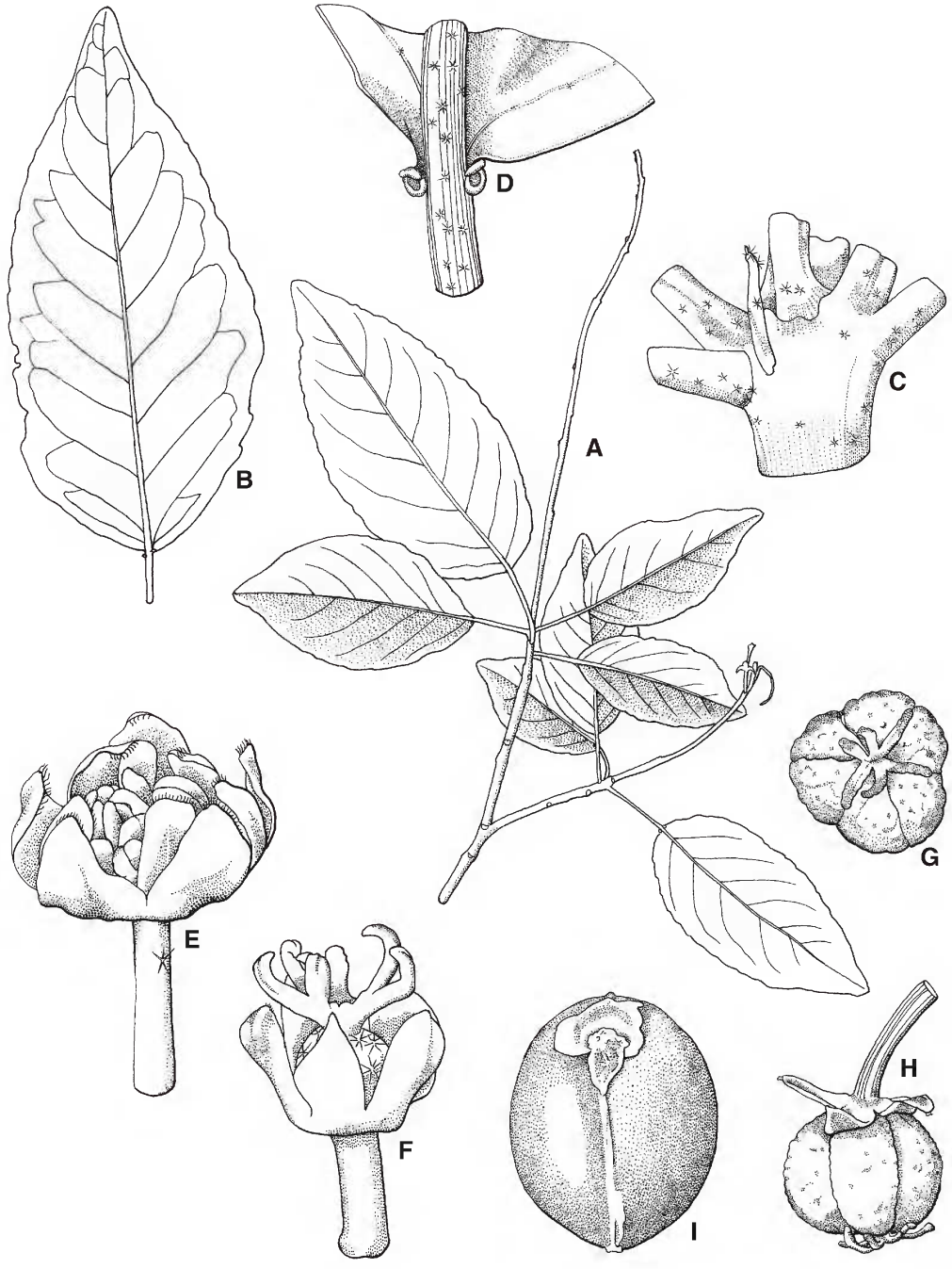


Fig. 6. ***Croton byrnesii.*** A. fruiting branchlet. × 0.8. B. undersurface of leaf. × 1. C. node showing stipule. × 8. D. base of leaf lamina showing extrafloral nectaries. × 8. E. male flower. × 12. F. female flower. × 8. G & H. fruit. × 4. I. seed. × 8. A,B,I from *Brock* 8402 (BRI); C–F from *Russell-Smith* 845 (BRI); G & H from *Dunlop* 7628 (BRI). Del. W. Smith.

***Notes*:** *Croton byrnesii* is a distinctive species that has been confused at times by collectors with *C. habrophyllus*. As noted by Airy Shaw (1981), *Croton byrnesii* differs from that species in the near glabrescence of the foliage (the trichomes ferruginous to yellow) and the long stipitate foliar glands that are on the petiole 0.4–1 mm below the lamina base.

***Conservation status*:** *Croton byrnesii* is restricted in its distribution but appears relatively common in its known range. The species is present in Kakadu N.P. No conservation coding is thought necessary.

***Etymology*:** The epithet honours the late Norm Byrnes (1922–1998), former botanist at DNA and BRI, and first collector of the species. Norm made many pioneering collections of plants in eastern Arnhem Land while resident botanist at DNA, including the type of this species.

7. Croton capitatus Michx., Fl. Bor.-Amer. 2: 214 (1803); *Pilinophytum capitatum* (Michx.) Klotzsch in Wiegmann, Arch. Naturges. 7: 255 (1841). **Type:** United States of America. Illinois, *Michaux* (holo: P-Michaux *n.v.*, fiche at BRI!; iso: P-JU *n.v.*, fiche at BRI!).

***Illustrations*:** Small (1913: 454, fig. 2714); James & Harden (1990: 420).

Erect herb to 80 cm high, monoecious, annual. Indumentum silver. Stems rounded, with dense sessile and stalked stellate trichomes. Stipules linear, 2–3 mm long, c. 0.1 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 5–48 mm long, 0.7–0.8 mm wide, with dense sessile and stalked stellate trichomes; lamina lanceolate-ovate, oblong to ovate, 18–55 mm long, 9–25 mm wide, palminerved with 3 veins at base and 3–5 lateral veins per side of midrib further up the lamina, tertiary reticulate veins obscure; upper surface dark silver-green, venation obscure, with sparse to dense stellate trichomes; lower surface silver, venation weakly visible, with dense stellate trichomes; margins entire to weakly sinuate, foliar glands inconspicuous; tip acute to rounded; base cuneate to truncate; extrafloral nectaries absent at leaf lamina base. Inflorescence up to 20 mm long, androgynous, ± sessile; axis with dense sessile and stalked stellate trichomes; bracts linear, 3–4 mm long, c. 0.1 mm wide, with dense stalked stellate trichomes. Male flowers 2–3 mm long, 2–4 mm diameter, held singly or in glomerules of 2–3 flowers on inflorescence, spaced up to 2 mm apart; pedicels 1.8–2.5 mm long, c. 0.2 mm wide, with dense stalked stellate trichomes; sepals valvate, 5, obovate, c. 1.6 mm long and 1.2 mm wide, with dense stalked stellate trichomes; petals 5, oblanceolate, 1.6–2.2 mm long, 0.4–0.5 mm wide, lanate; stamens 10–12, filaments flattened, 1.8–2 mm long, c. 0.2 mm wide, glabrous, anthers oblong, 0.7–0.8 mm long, 0.4–0.5 mm wide. Female flowers c. 11 mm long and 12 mm diameter, held singly and spaced up to 3 mm apart, ± sessile; sepals valvate, 6–8, oblanceolate to obovate, 4–4.8 mm long, 0.5–2 mm wide, with dense stalked stellate trichomes; petals absent; styles 3, linear, 3–3.5 mm long, multifid, thrice divided, connate at base for c. 0.2 mm, with sparse sessile stellate trichomes; ovary 3-locular, c. 2.5 mm long and 4 mm diameter, with dense stalked and sessile stellate trichomes. Fruits trilobate, globose, 7–9 mm long, 7–9 mm diameter, with dense, sessile and stalked stellate trichomes. Seeds orbicular, c. 5 mm long, 4–4.5 mm wide, 2.5 mm thick, orange-brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge 4.5–5 mm long; caruncle crescent shaped, c. 0.7 mm long and 0.7 mm wide, brown-red.

Additional specimens: **United States of America.** OHIO: near Cincinnati, Sep 1880, *Lloyd* [AQ206109] (BRI). MISSOURI: St Louis, Aug 1878, *Martindale* [AQ206110] (BRI). **Australia. New South Wales.** Dubbo to Collie road, 35 miles NW of Dubbo & 15 miles S of Collie, Feb 1955, *Wheeler* (NSW293822).

***Distribution and habitat*:** *Croton capitatus* is native to the United States of America where it is known from New Jersey, Illinois, Kentucky, Missouri, Arkansas, Louisiana, Tennessee, Texas, Oklahoma, Kansas, Iowa, Alabama and North Carolina (Ferguson 1901; Small 1913; Johnston 1959). It is reported as being sparingly naturalised in agricultural land in southern New South Wales south of Collie (**Map 9**) (James & Harden 1990). I have seen only the cited specimen and it needs to be determined if this plant is still naturalised in Australia.

***Phenology*:** Unknown in Australia.

***Notes*:** Michaux (1803) did not specify a herbarium location for the single cited collection from Illinois and no mention of type material for *Croton capitatus* was made by Ferguson (1901). Johnston (1959) saw a photo at GH of a specimen in P but was not specific as to the location within that herbarium. There is a Michaux collection of *Croton capitatus* from Illinois that is present in P-Michaux and P-JU. This collection is presumed to be the type with the P-Michaux sheet considered as the holotype.

Webster (1993a) placed *C. capitatus* in *Croton* section *Pilinophyton* (Klotzsch) A.Gray.

8. Croton capitis-york Airy Shaw, Muelleria 4: 226 (1980). **Type:** Queensland. Cook District: Silver Plains Holding between Rocky River and Massey Creek, 13 September 1973, *G.C. Stocker* 1077 (holo: QRS; iso: BRI, CANB).

Croton capitis-york var. *pilosus* Airy Shaw, Muelleria 4: 226 (1980). **Type:** Queensland. Cook District: 2 km south of Temple Bay Outstation, 12°22'S, 143°05'E, Sep 1976, *B. Hyland* 8995 (holo: QRS).

***Illustrations*:** Airy Shaw (1981: 619, fig. 2A); Forster (1991: 571).

Shrub to 5 m high, monoecious, evergreen, perennial. Indumentum silver. Branchlets rounded, with dense peltate scales. Stipules minute, triangular, < 0.3 mm long and 0.3 mm wide, entire. Leaves alternate, discolorous, petiolate; petioles 3–27 mm long, c. 1 mm wide, with dense stellate trichomes when young, glabrescent; lamina elliptic-ovate, chartaceous, 30–160 mm long, 12–60 mm wide, penninerved with 7–11 lateral veins per side of midrib, tertiary reticulate veins absent; upper surface grey-green, lateral veins indistinct, with scattered to sparse peltate scales; lower surface pale grey-green to silver, lateral veins strongly developed, with sparse to dense peltate scales, neither scabrid nor velutinous; margins entire or weakly sinuate, foliar glands inconspicuous; tip acute, acuminate; base cuneate, truncate; extrafloral nectaries 2, just below leaf lamina base, stipitate to 0.6 mm long, ellipsoid, c. 0.9 mm long and 0.5 mm wide, visible above and below. Inflorescence up to 70 mm long, unbranched, mainly unisexual but occasionally androgynous, pedunculate up to 20 mm; axis with dense peltate scales; bracts lanceolate, c. 0.8 mm long and 0.3 mm wide, with dense peltate trichomes. Male flowers 1.8–2.3 mm long, 3.5–4 mm diameter, densely clustered on inflorescence in glomerules of 3–5 flowers, or spaced to 5 mm apart; pedicels 1.4–1.5 mm long, c. 0.5 mm wide, with dense peltate scales; sepals valvate, 5, lanceolate-ovate, 1.9–2 mm long, 1.3–1.4 mm wide, lanate in upper half; petals 5, lanceolate-ovate, 1.4–1.5 mm long, c. 0.6 mm wide, lanate in upper half; stamens 10–12, filaments filiform, 1.5–2.2 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.8–0.9 mm long, 0.4–0.5 mm wide. Female flowers not seen; styles 3, obloid, up to 1.3 mm long and 0.2 mm wide, bifid for up to 0.8 mm long, glabrous. Fruits trilobate, subglobose, 6–7 mm long, 7–8 mm diameter, with dense, stellate trichomes on mamillate protuberances. Seeds ± obloid, 4.9–5 mm long, 3.2–3.3 mm wide, c. 3 mm thick, pale glossy brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge c. 3.4 mm long; caruncle weakly crescent shaped, c. 1.4 mm long and 1 mm wide, tan-yellow. **Fig. 7.**

***Selected additional specimens*: Queensland.** Cook District: 4 km SW of Cape Weymouth - Scrubby Creek, 12°38'S, 143°24'E, May 1990, *Fell* DGF2118 (BRI, QRS); Scrubby Creek, between the Rocky and Chester Rivers, Silver Plains, 13°46'S, 143°30'E, Dec 1990, *Fell* DGF2286 (BRI); Kalpowar Pastoral Holding, 10 km ESE of the Normanby River mouth, 14°26'S, 144°13'E, Nov 1992, *Fell* DGF2750 & *Stanton* (BRI, QRS); 4.5 km WSW of the Nesbit River mouth, 57 km NE of Coen, 13°33'S, 143°22'E, Aug 1993, *Fell* DGF3451 *et al.* (BRI); Carron Valley road, 44 km from Moreton Telegraph Station, 12°29'S, 142°57'E, Jun 1988, *Forster* PIF4547 & *Tucker* (BRI); Maloneys Springs, 40 km E by road of Moreton Telegraph Station, 12°28'S, 142°55'E, Jun 1989, *Forster* PIF5468 (BRI, DNA, LAE); 2 km NW of Bolt Head, Temple Bay, 12°15'S, 143°04'E, Jul 1991, *Forster* PIF8957 (BRI, DNA, K, MEL, QRS); 27 km along road to Leo Creek mine, McIlwraith Range, 13°42'S, 143°17'E, *Forster* PIF10050 *et al.* (BRI, K, L, MEL, QRS); 31 km along road to Leo Creek mine, McIlwraith Range, 13°42'S, 143°18'E, Jun 1992, *Forster* PIF10262 *et al.* (BRI, QRS); T.R. 9, Lankelly Creek, 13°53'S, 143°14'E, Jun 1992, *Forster* PIF10331 *et al.* (BRI, MEL, QRS); 3 km N of Massy Creek Crossing, Silver Plains Station, 13°53'S, 143°31'E, Jun 1992, *Forster* PIF10579 *et al.* (BRI, QRS); 3 km SSW of Rocky River Crossing, Silver Plains, 13°49'S, 143°27'E, Jul 1993, *Forster* PIF13668 *et al.* (BRI); Captain Billy Landing turnoff, on Coen to Bamaga road, 11°41'S, 142°41'E, Jun 1994, *Forster* PIF15360 (BRI, MEL, NSW, QRS); West Claudie River, 12°45'S, 143°15'E, Jun 1972, *Hyland* 6170 (BRI, QRS); Olive River, 12°10'S, 143°05'E, Sep 1974, *Hyland*

7449 (BRI, QRS); 0.5 km from main Peninsula road, on Captain Billy road, 11°41'S, 142°42'E, Feb 1992, *Johnson* 4945 (BRI, DNA); Nesbit River, 13°26'S, 143°10'E, Sep 1974, *Tracey* 14103 (BRI); North bank of Olive River near mouth, 12°07'S, 143°05'E, Sep 1974, *Tracey* 14488 (BRI); Bamaga Mission, 11.2 km SW of Cape York, Jan 1965, *Smith* 12393 (BRI); Mt Tozer, Iron Range area, 12°45'S, 143°15'E, Oct 1968, *Webb & Tracey* 8702 (BRI).

***Distribution and habitat*:** *Croton capitis-york* is restricted to northern Cape York Peninsula in Queensland (**Map 5**) where it has been collected from five 1° grid squares. Plants grow in semi-deciduous or evergreen microphyll to notophyll vinethickets and vineforest on sandy soils derived from sandstone.

***Phenology*:** Flowering records are few and have been made in April and June. Fruiting probably occurs two or three months later. This species generally has buds present for most of the year and probably flowers after storm or wet season rain.

***Notes*:** The recognition of varieties in *Croton capitis-york* has been previously refuted (Forster 1991). A putative hybrid individual between this species and *Croton dockrillii* was found at the Rocky River, Silver Plains (*Forster* 13669 *et al.*: BRI, QRS).

At Bolt Head there appears to exist a mixed population of typical *C. capitis-york* and atypical plants that are more densely silver pubescent below. These atypical plants [*Forster* PIF19391 (BRI, MEL) & PIF19406 (A, BRI, K, MEL, QRS)] also have leaf lamina glands that are visible only from below due to their position at the base of the leaf lamina. In typical *Croton capitis-york* these glands are at the junction of the petiole and lamina and are visible from both above and below the leaf. These atypical plants have not been collected in a fertile state so their status cannot be adequately resolved at this stage, although it is likely that they may represent an undescribed taxon.

Croton capitis-york shares the unusual character of fruit with stellate trichomes on mamillate protuberances, as found also in *C. mamillatus* and *C. stigmatosus* from southern Queensland.

***Conservation status*:** *Croton capitis-york* is not rare or threatened. It is present in conservation reserves at Iron Range and Heathlands National Parks.

***Etymology*:** The specific epithet alludes to the occurrence of this plant on Cape York Peninsula.

9. Croton caudatus Geisel., Croton. Monograph. 73 (1807). **Type:** ex India orient., *Dr. Rottler* (holo: C *n.v.*, fiche at BRI!).

Woody scrambler or liane, monoecious, deciduous, perennial. Indumentum uncoloured. Branchlets somewhat angular, with dense stellate trichomes when young, glabrescent. Stipules linear-subulate, 2.6–8 mm long, 0.3–0.58 mm wide, entire or divided and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 2–3 mm long, c. 1 mm diameter, with dense stellate trichomes; lamina elliptic to ovate, 12–140 mm long, 5–100 mm wide, palminerved with 5 veins at base and 3–6 lateral veins per side of midrib further up the lamina, tertiary reticulate veins obscure; upper surface dark matt-green, lateral veins weakly visible, with scattered to sparse, stellate trichomes; lower surface pale silver-green, venation weakly visible, with dense stellate trichomes, glabrescent, neither scabrid nor velutinous; margins crenate with 25–30 short teeth up to 2 mm long, foliar glands prominent; tip acute, acuminate; base cuneate, cordate, lobate; extrafloral nectaries 2 at lamina base, sessile or stipitate up to 1 mm, circular, c. 0.6 mm diameter, visible above and below. Inflorescence up to 250 mm long, unbranched, usually unisexual but occasionally androgynous, pedunculate up to 50 mm; axis with dense stellate trichomes; bracts linear-lanceolate, 1.2–6 mm long, 0.2–0.3 mm wide, with sparse to dense stellate trichomes. Male flowers 5–7 mm long, 6–8 mm diameter, held singly or in glomerules of 1–6 flowers on inflorescence, spaced up to 2 mm apart; pedicels 3–9 mm long, c. 0.5 mm wide, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate, 2–3 mm long, 1.2–1.8 mm wide, with dense stellate trichomes; petals 5, obovate, 2.5–3.5 mm long, 1.2–1.7 mm wide, lanate; stamens 23–36, filaments filiform, 3–5.5 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.8–0.9 mm long, 0.6–0.7 mm wide. Female flowers 3.5–4 mm long, 5–7 mm diameter, held singly and spaced up to 10 mm apart; pedicels 1–3.5 mm long, 1–1.2 mm diameter, with sparse stellate trichomes; sepals valvate, 5, lanceolate to lanceolate-ovate, 2.8–6 mm long, 1.5–2.5 mm wide, with stellate trichomes; petals absent; styles 3, linear, 3–5.5 mm long, bifid for 2.5–5 mm, connate at base for

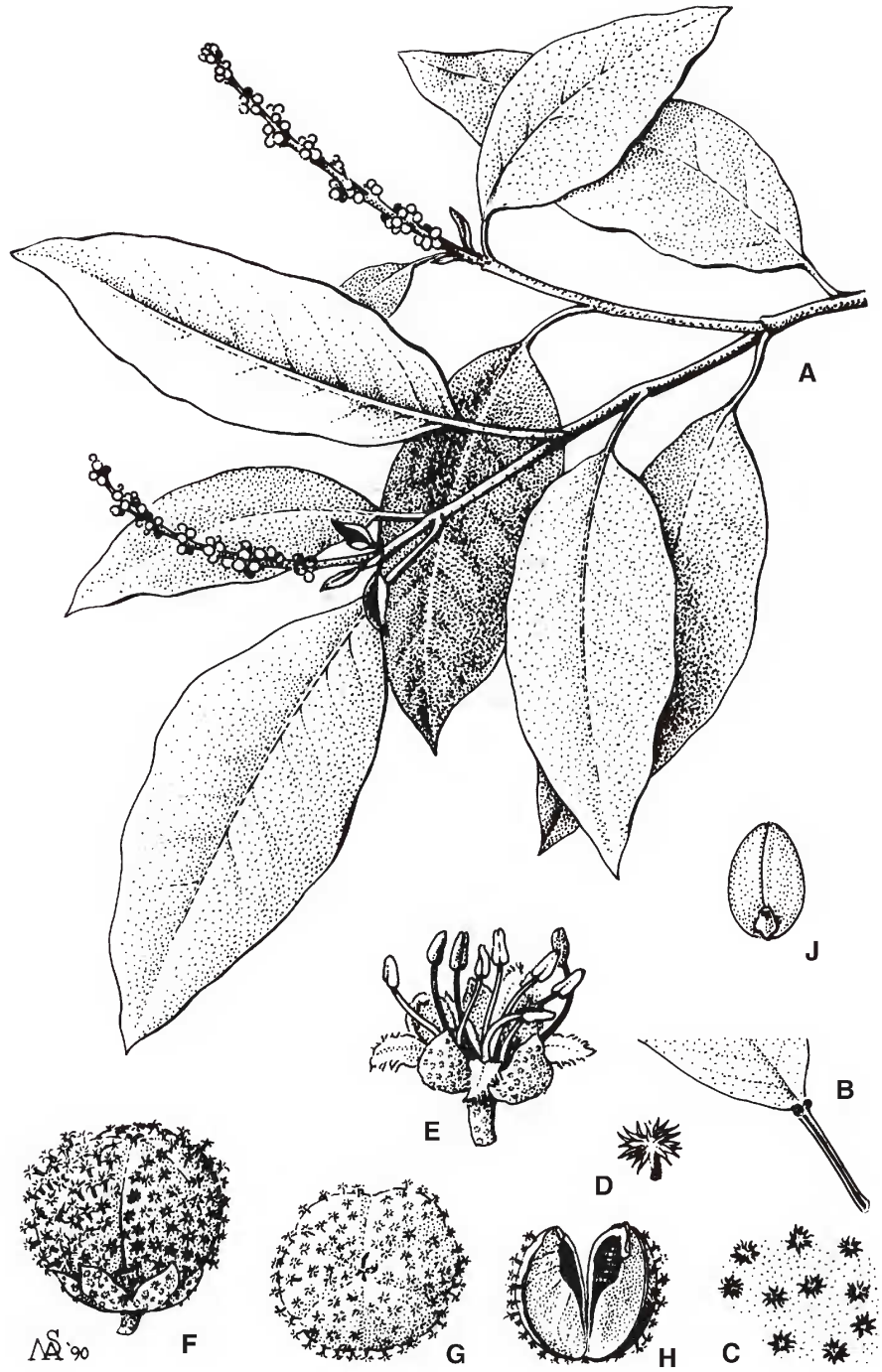


Fig. 7. ***Croton capitis-york.*** A. habit. × 0.75. B. leaf base showing extrafloral nectaries. × 0.75. C. detail of leaf surface showing stellate trichomes. × 12. D. stalked stellate trichome from leaf. × 25. E. male flower. × 6. F & G. fruit. × 3. H. dehisced coccus. × 3. J. seed. × 3. A–E. from *Clarkson* 3641 (BRI); F–J from *Morton* 905 (BRI). Del. M. Saul. Plate reproduced with permission from Forster (1991: 571).

0.2–0.6 mm, with scattered stellate trichomes in lower half; ovary 3-locular, 2.8–3.5 mm long, 2.8–3.5 mm diameter, with dense, sessile and stalked stellate trichomes. Fruits ± globose, 14–22 mm long, 14–24 mm diameter, with dense, sessile and stalked stellate trichomes. Seeds ± ovoid, c. 9 mm long, 7 mm wide, 5 mm thick, brown, ventral surface rounded to weakly bifacial, dorsal surface rounded, micropylar ridge c. 7 mm long; caruncle flattened-ovate, 1–1.5 mm long, c. 2.5 mm wide, pale-brown. **Fig. 8**.

***Selected additional specimens*: Malaysia.** S. Pahang, Fort Iskandar, Mar 1959, *Woods* 1716 (L); Sumatra, Palembang, forest N of G. Roepit, *Forbes* 2572 (L); Sarawak, G. Berloban, 10 km from Tebakang, Tebedu road, Jul 1982, *Yii & Othman* S46180 (L); Sabah, Limbuah darat Banggi Island, Aug 1964, *Ampuria* SAN40384 (L); Hap Seng Plantation road to Sg. Tangkulap, Karamuak, Jun 1982, *Sundaling* SAN90427 (L). **Singapore.** Bukit Timah Nature Reserve, Nov 1982, *Maxwell* 82–286 (L). **Indonesia,** Kalimantan, East Kutai Resrve, vicinity of Sengata & Mentoko rivers, 0°30'N, 117°20'E, Dec 1978, *Leighton* 354 (L); Java, Prov. Besuki, 1895, *Koorders* 20572(L); Sulawesi, northern central part, near Palu, 0°53'S, 119°53'E, Apr 1975, *Meijer* 9200 (L). **Philippines.** Palawan, May 1913, *Merrill* 1243 (BRI, L). **Australia. Christmas Island.** Bordering settlement, Poon San road, 10°26'S, 105°42'E, Sep 1984, *Mitchell* 167 (CANB). **Queensland.** Cook District: Chili Creek, 12°39'S, 143°23'E, Jul 1993, *Forster* PIF13570 *et al.* (BRI, MEL); ditto, Jan 1982, *Hyland* 11568 (QRS); ditto, Mar 1982, *Hyland* 11742 (QRS); ditto, Dec 1982, *Hyland* 12432 (QRS).

***Distribution and habitat*:** *Croton caudatus* is widespread in western parts of Malesia and Asia (Bangledesh, Bhutan, China, India, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand) (Chakrabarty & Balakrishnan 1997), but is known in mainland Australia only from one population at Chili Creek on Cape York Peninsula (**Map 7**). It is also recorded from Christmas Island in the Indian Ocean, an Australian territory (Du Puy & Telford 1993). Plants grow as canopy lianes in semi-deciduous notophyll vineforest.

***Phenology*:** In Australia flowering occurs from December to January and fruiting from March to April.

***Notes*:** Geiseler (1807) based his taxa on specimens in the Vahl herbarium. This herbarium is now deposited at C and sheet 15 appears to represent type material of *Croton caudatus*. A long list of synonyms is given for this species by Chakrabarty & Balakrishnan (1997) and is not repeated here.

Croton caudatus is the only climbing *Croton* in Australia and this lifeform is very rare in the genus throughout its range (Chakrabarty & Balakrishnan 1997; Secco & Rosa 1992).

***Conservation status*:** *Croton caudatus* is very restricted in its Australian occurrence and has perhaps arrived in Australia by accidental human intervention at some time. The only known population is within the Iron Range National Park. No conservation coding is thought necessary at this stage, however, the population could be construed as being endangered due to its proximity to a road.

***Etymology*:** The specific epithet is derived from Latin and probably refers to the shape of the leaf base in this species.

10. Croton choristadenius K.Schum., Nachtr. 295 (1905). **Type**: Papua New Guinea. Augusta-Station, September 1887, *M. Hollrung* 705 (syn: K *n.v.*, photo at BRI!; L *n.v.*); Ramufluss, 15 July 1898, *Tappenbeck* 116 (syn: *n.v.*).

Croton philombros Croizat, J. Arnold Arb. 23: 371 (1942). **Type**: Papua New Guinea. Western Province: Penzara, between the Morehead & the Wassi Kussa Rivers, December 1936, *L.J. Brass* 8455A (holo: A *n.v.*; iso: BRI; L *n.v.*).

Croton pusilliflorus Croizat, J. Arnold Arb. 23: 374 (1942). **Type**: Papua New Guinea. Western Province: Palmer River, below the junction with the Black River, July 1936, *L.J. Brass* 7226 (holo: A *n.v.*; iso: BRI; L *n.v.*).

Croton semunculus Croizat, J. Arnold Arb. 23: 374 (1942). **Type**: Papua New Guinea. Central Province: Nakeo district, Baroka, 10 April 1933, *L.J. Brass* 3770 (holo: A *n.v.*; iso: BRI).

Shrub or tree to 10 m high, monoecious, evergreen, perennial. Bark nondescript, somewhat tessellated; blaze reddish-pink; wood straw. Indumentum silver or silver-ferruginous. Branchlets ± rounded, with admixture of dense stellate trichomes, peltate trichomes and peltate

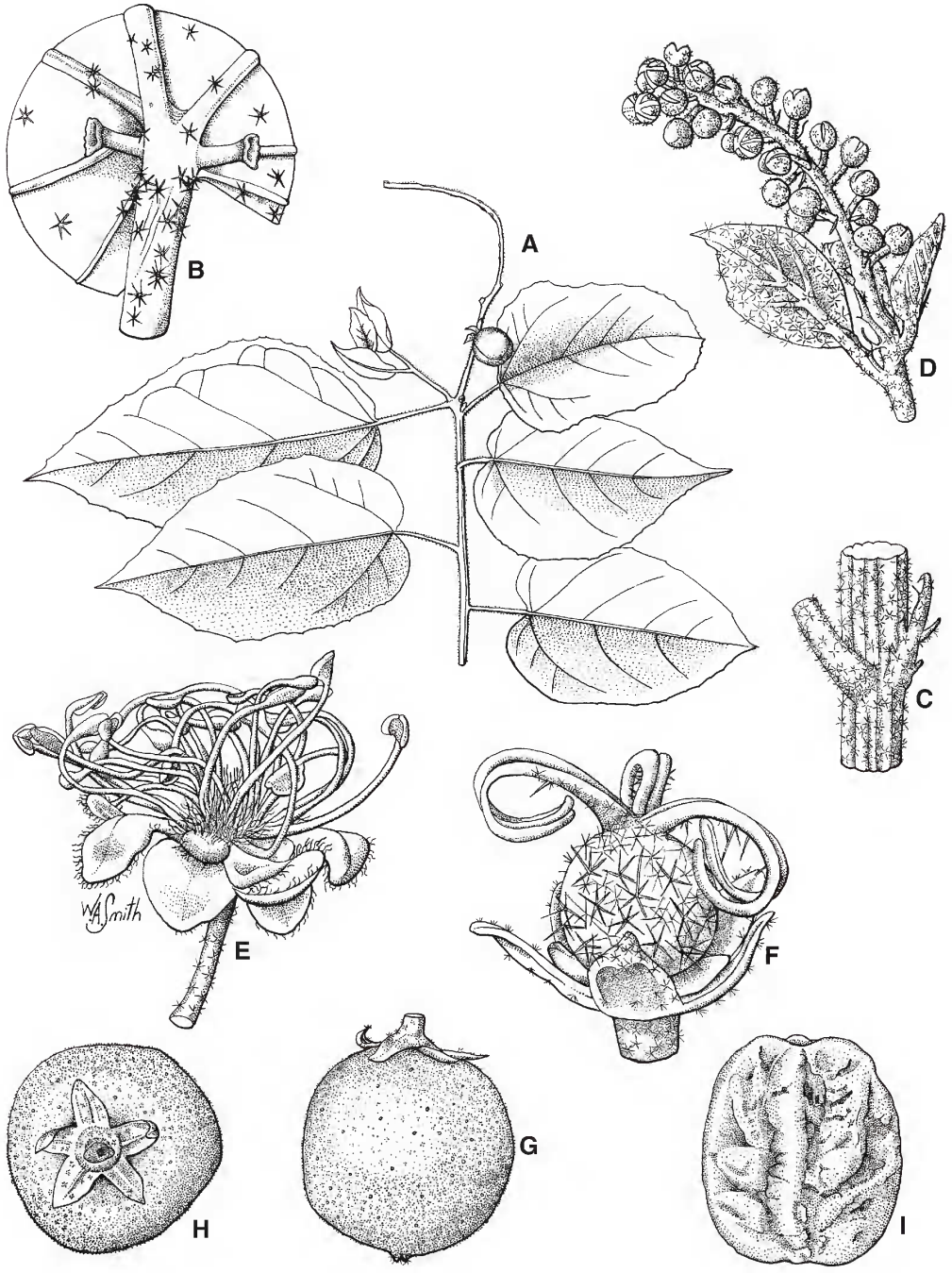


Fig. 8. ***Croton caudatus***. A. fruiting branchlet. × 0.5. B. base of leaf lamina showing extrafloral nectaries. × 8. C. node showing stipule. × 4. D. inflorescence with male flower buds. × 2. E. male flower. × 6. F. female flower. × 8. G & H. fruits. × 1.5. I. seed. × 3. A, B, G, H from *Hyland* 11568 (BRI); C from *Forster* PIF13570 (BRI); D–F from *Hyland* 12432 (QRS); I from *Hyland* 11742 (QRS). Del. W. Smith.

scales, glabrescent. Stipules linear, 0.5–1 mm long, 0.1–0.2 mm wide, entire and with sparse to dense peltate scales. Leaves alternate, discolorous, petiolate; petioles 10–40 mm long, 0.7–1 mm wide, with scattered peltate trichomes and peltate scales; lamina elliptic to ovate, 30–110 mm long, 15–40 mm wide, penninerved with 10–12 lateral veins per side of midrib, tertiary reticulate veins indistinct; upper surface dark green, venation weakly visible, glabrous; lower surface pale green, lateral veins weakly prominent, with widely scattered, peltate trichomes, neither scabrid nor velutinous; margins crenate to denticulate with 20–36 teeth up to 0.2 mm long, foliar glands prominent; tip acute, short to long acuminate; base rounded; extrafloral nectaries 2 at base of lamina, sessile, ellipsoid, 0.8–1.2 mm long, 0.7–0.8 mm wide, visible below only. Inflorescence up to 120 mm long, androgynous, pedunculate up to 20 mm; axis with sparse peltate trichomes; bracts linear-lanceolate, 0.8–1.3 mm long, 0.2–0.5 mm wide, with sparse, peltate trichomes. Male flowers 2.5–3 mm long, 2.5–3 mm diameter, evenly distributed in upper 3/4 of inflorescence; pedicels 1.5–2 mm long, c. 0.4 mm wide, with sparse peltate trichomes; sepals valvate, 5, lanceolate-triangular, 1.3–1.5 mm long, 0.7–0.8 mm wide, with scattered peltate trichomes, lanate at tip; petals 5, oblanceolate, 1.8–2 mm long, c. 0.5 mm wide, lanate near tip and near base; stamens 11 or 12, filaments filiform, 1.2–1.5 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.5–0.6 mm long, 0.5–0.8 mm wide. Female flowers 2.5–3 mm long, 2.5–3 mm diameter, held singly and spaced up to 7 mm apart; pedicels 1–1.5 mm long, c. 1 mm diameter, with sparse to dense, peltate trichomes; sepals valvate, 5, lanceolate, 1.5–1.8 mm long, 1.2–1.3 mm wide, with scattered peltate trichomes and stellate trichomes; petals absent; styles 3, linear-flabellate, 1–1.2 mm long, bifid for 0.7–0.9 mm, with scattered peltate trichomes near base; ovary 3-locular, 1.8–2 mm long, 1.4–1.5 mm diameter, with dense, peltate trichomes and occasional stellate trichomes. Fruits trilobate, depressed-globose, 4–5 mm long, 5–6 mm diameter, with sparse, sessile stellate trichomes. Seeds ± obloid, 3–3.5 mm long, 2.5–2.8 mm wide, 2–2.2 mm thick, glossy brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge 1.8–2 mm long; caruncle ellipsoidal, c. 1.8 mm long and 1 mm wide, yellowish. **Fig. 9**.

***Additional specimens*: Papua New Guinea.** Morobe Province: Lower Inokanda L.A., Bulolo, 7°10'S, 146°40'E, Jun 1962, *Havel* NGF9168 (BRI); Crooked Creek L.A., Bulolo, Jul 1964, *Havel* NGF25550 (BRI); Bulolo Valley, 7°10'S, 146°40'E, Oct 1955, *McVeigh & Ridgwell* NGF7368 (BRI); Busu River, 7°25'S, 147°10'E, Aug 1970, *Streimann* NGF45101 (BRI). Central Province: c. 2 miles W of Kanosia Plantation, Jul 1962, *Darbyshire* 602 (BRI); Cape Rodney, TP107, near P.I.T. Sawmill, Jun 1968, *Henty* NGF38618 (BRI). Northern Province: near Davatutu Village, Jul 1953, *Hoogland* 3396 (BRI); Oive Ridge, Jul 1964, *Millar* NGF23521 (BRI). **Australia, Queensland**. Cook District: Macrossan Range, Turrel Hill, Silver Plains, 13°30'S, 143°30'E, Jul 1997, *Forster* PIF21326 et al. (A, AD, BRI, DNA, L, MEL, MO, NSW, QRS); ditto, *Forster* PIF21327 et al. (A, AD, BRI, DNA, MEL, NSW, QRS).

***Distribution and habitat*:** *Croton choristadenius* occurs in Papua New Guinea in the Morobe, Central and Northern Provinces and is here newly recorded from a single locality on Cape York Peninsula in Queensland (**Map 3**) in the most speciose grid square in Australia for *Croton* taxa. At Turrel Hill *Croton choristadenius* forms a canopy tree in low semi-deciduous complex notophyll vineforest on metamorphic derived substrate.

***Phenology*:** Flowers were recorded in July in Queensland. Specimens from Papua New Guinea have had flowers in the months of June-August and fruit in the months of July and October.

***Notes*:** *Croton choristadenius* was renamed several times by Croizat (1942) based on a series of collections by Brass in southern New Guinea. These names were subsequently reduced to the synonymy of *C. choristadenius* by Airy Shaw (1980a).

This species was included in *Croton* section *Tiglium* (Klotzch) Baill. by Webster (1993a), but transgresses the characters given for that section in the admixture of peltate scales and stellate trichomes (versus stellate trichomes only).

Croton choristadenius is one of four Australian species of *Croton* that form small trees, the others being *C. insularis, C. phebalioides* and *C. stigmatosus*. Consequently I have included brief descriptors on bark, blaze and wood in the descriptions for these taxa.

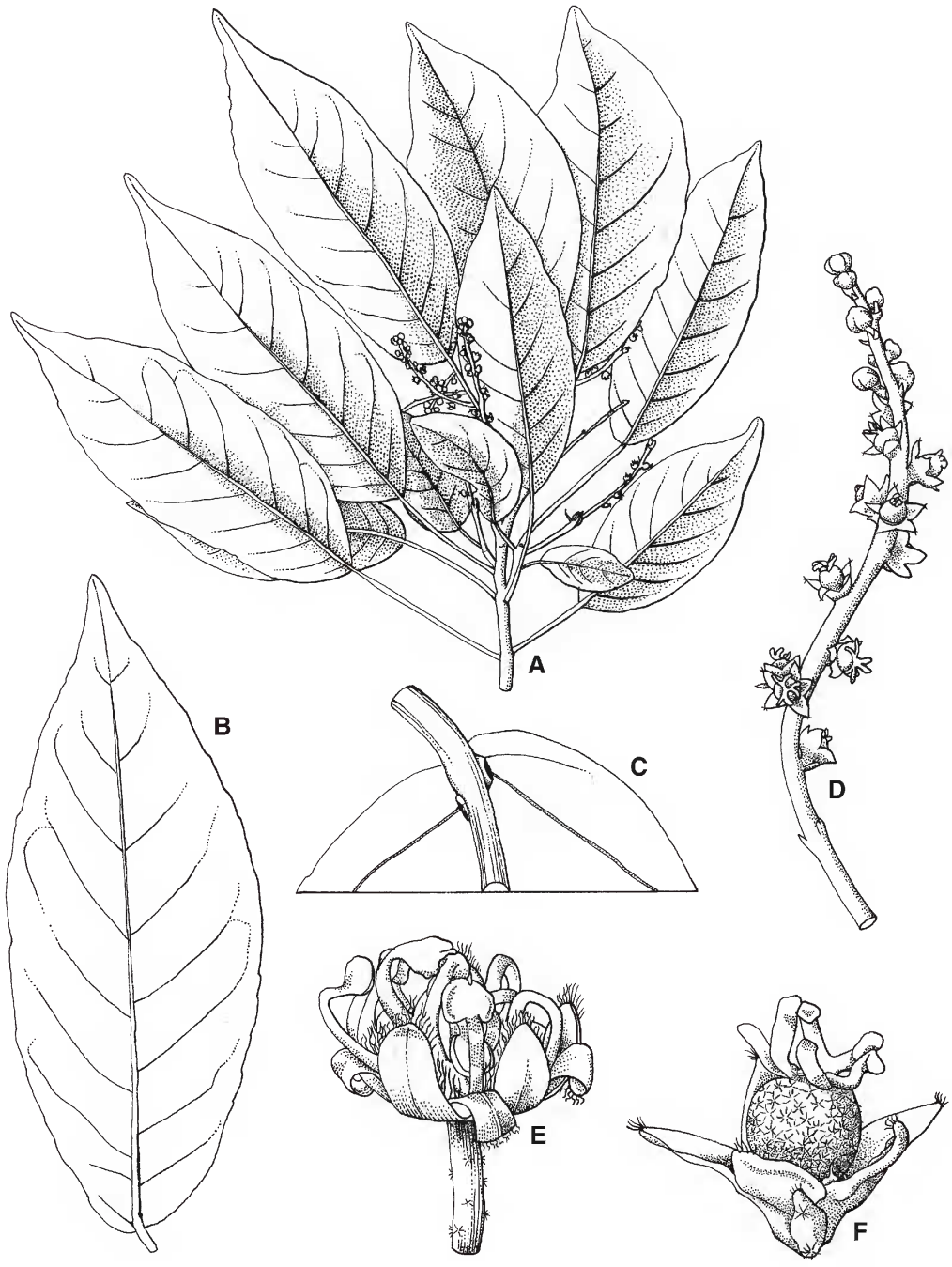


Fig. 9. ***Croton choristadenius***. A. flowering branchlet. × 0.6. B. undersurface of leaf. × 1. C. base of leaf lamina showing extrafloral nectaries. × 6. D. inflorescence with female flowers in lower half and male flower buds in upper half. × 2. E. male flower. × 10. F. female flower. × 10. A–D, F from *Forster* PIF21326 (BRI); E from *Forster* PIF21327 (BRI). Del. W. Smith.

***Conservation status*:** In Queensland *Croton choristadenius* is a very rare tree and has only been seen on one ridge of Turrel Hill where it was locally common over about a hectare. Further investigation of other parts of Turrel Hill and the adjacent Xena Hill in 1998 did not reveal further individuals of this species. Further unexplored hills in the Macrossan Range require examination for additional populations of this species. *Croton choristadenius* has not been found in Iron Range and surrounds or near Bamaga, so it may be reasonable to assume that it is truly restricted in its Queensland occurrence. Turrel Hill is now included in Aboriginal controlled land and the future of land management in favour of rare plants in this area remains uncertain.

***Etymology*:** From the latin *chorisis* (to split into parts) and *adenius*, and probably referring to the leaf lamina glands.

11. Croton densivestitus C.T.White & W.D.Francis, Proc. Roy. Soc. Queensland 35: 80–83, fig. 9 (1923) ('densivestitum'). **Type:** Queensland. Cook District: Harvey's Creek, 1889, *F.M. Bailey* (holo: BRI; iso: MEL).

Croton pubens Domin, Biblioth. Bot. 89: 882, t. 31, fig. 11–19 (1928). **Type:** Queensland. Cook District: Harvey's Creek and near estuary of Russell River, 1909–10, *Domin* (holo: ?PR *n.v.*).

Shrub to 3 m high, monoecious, evergreen, perennial. Indumentum yellow. Branchlets rounded, with dense stellate trichomes. Stipules linear-lanceolate, 3.5–4 mm long, 0.3–1 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 3–30 mm long, 1–1.5 mm wide, with dense stellate trichomes; lamina elliptic to ovate, 40–180 mm long, 20–80 mm wide, penninerved with 12–14 lateral veins per side of midrib, tertiary reticulate veins obscure; upper surface dark green, venation not visible, glabrous or with scattered stellate trichomes; lower surface pale green, lateral veins weakly prominent, with dense, stellate trichomes, markedly velutinous; margins denticulate with 20–23 teeth up to 0.2 mm long, foliar glands prominent; tip acute, short to long acuminate; base rounded, weakly cordate; extrafloral nectaries 2 at base of lamina, stipitate to 1.5 mm, circular, 0.7–0.9 mm long, 0.7–0.9 mm wide, visible below only. Inflorescence up to 70 mm long, androgynous, pedunculate up to 20 mm; axis with dense stellate trichomes; bracts lanceolate, 0.8–1.3 mm long, 0.2–0.3 mm wide, with sparse to dense stellate trichomes. Male flowers c. 2.5 mm long and 3.5 mm diameter, densely clustered towards top of inflorescence; pedicels 1.8–2 mm long, 0.1–0.3 mm wide, with dense stellate trichomes; sepals valvate, 5, lanceolate to lanceolate-ovate, 1.3–1.6 mm long, c. 0.8 mm wide, with dense stellate trichomes, lanate at tip; petals 5, oblanceolate, c. 1.5 mm long and 0.4 mm wide, lanate in upper half; stamens 11 or 12, filaments filiform, 1.5–1.8 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.4–0.5 mm long, c. 0.3 mm wide. Female flowers 2.5–3.5 mm long, 3–4.5 mm diameter, held singly and spaced up to 10 mm apart; pedicels 1.2–2 mm long, 0.5–0.6 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate, 1.3–1.8 mm long, 0.4–0.8 mm wide, with dense stellate trichomes; petals absent; styles 3, linear, 2.5–3 mm long, bifid for 1.5–2.2 mm, with sparse stellate trichomes in lower half; ovary 3-locular, 1–2 mm long, 1.2–2 mm diameter, with dense, ± sessile stellate trichomes. Fruits trilobate, depressed-globose, 4.5–6 mm long, 6–8 mm diameter, with scattered, ± sessile stellate trichomes. Seeds ± ovoid, 4.5–4.8 mm long, 3.8–4.5 mm wide, 2.5–3 mm thick, brown and white blotched, ventral surface ± rounded, dorsal surface rounded, micropylar ridge 3–3.5 mm long; caruncle truncate-ovate, c. 0.5 mm long and 1.2 mm wide, cream. **Fig. 10**.

***Additional specimens examined*: Queensland.** Cook District: Harvey's Creek, s.dat., *Bailey* [AQ202099] (BRI); Mt Bellenden Ker, 17°16'S, 145°54'E, Sep 1992, *Christensen* 792 (AD, BRI); Carrington road, Carrington, S of Atherton, 17°18'S, 145°27'E, Jun 1999, *Ford* 2236 (BRI, QRS); Base of Bellenden Ker, 17°15'S, 145°53'E, Jul 1993, *Forster* PIF13740 & *Lyons* (BRI, MEL, QRS); Harvey's Creek headwaters, 17°15'S, 145°53'E, Jul 1994, *Forster* PIF15499 *et al.* (BRI); Bellenden Ker Cable Car Station, 17°16'S, 145°54'E, Jan 2002, *Forster* PIF28215 *et al.* (A, BRI, K, L, MEL, WIS); Cooroo Lands, W of Innisfail, 17°31'S, 145°53'E, Jul 1971, *Hyland* 5259 (BRI, QRS); S.F.R. 607, Parish of Cairns, Shoteel L.A., 16°56'S, 145°36'E, Oct 1991, *Hyland* 14258 (QRS); N.P.R. 226, Bellenden Ker, 17°16'S, 145°53'E, Aug 1992, *Hyland* 14517 (QRS); V.C.L. Parish of Glady, 17°31'S, 145°56'E, Sep 1992, *Hyland* 14583 (QRS); Harvey Creek, c. 1.3 km upstream from Bruce Highway, 17°15'S, 145°54'E, Jan 1994, *Jago* 3061 (BRI); Warramami Hill, c. 11 km by road W of Bruce Highway

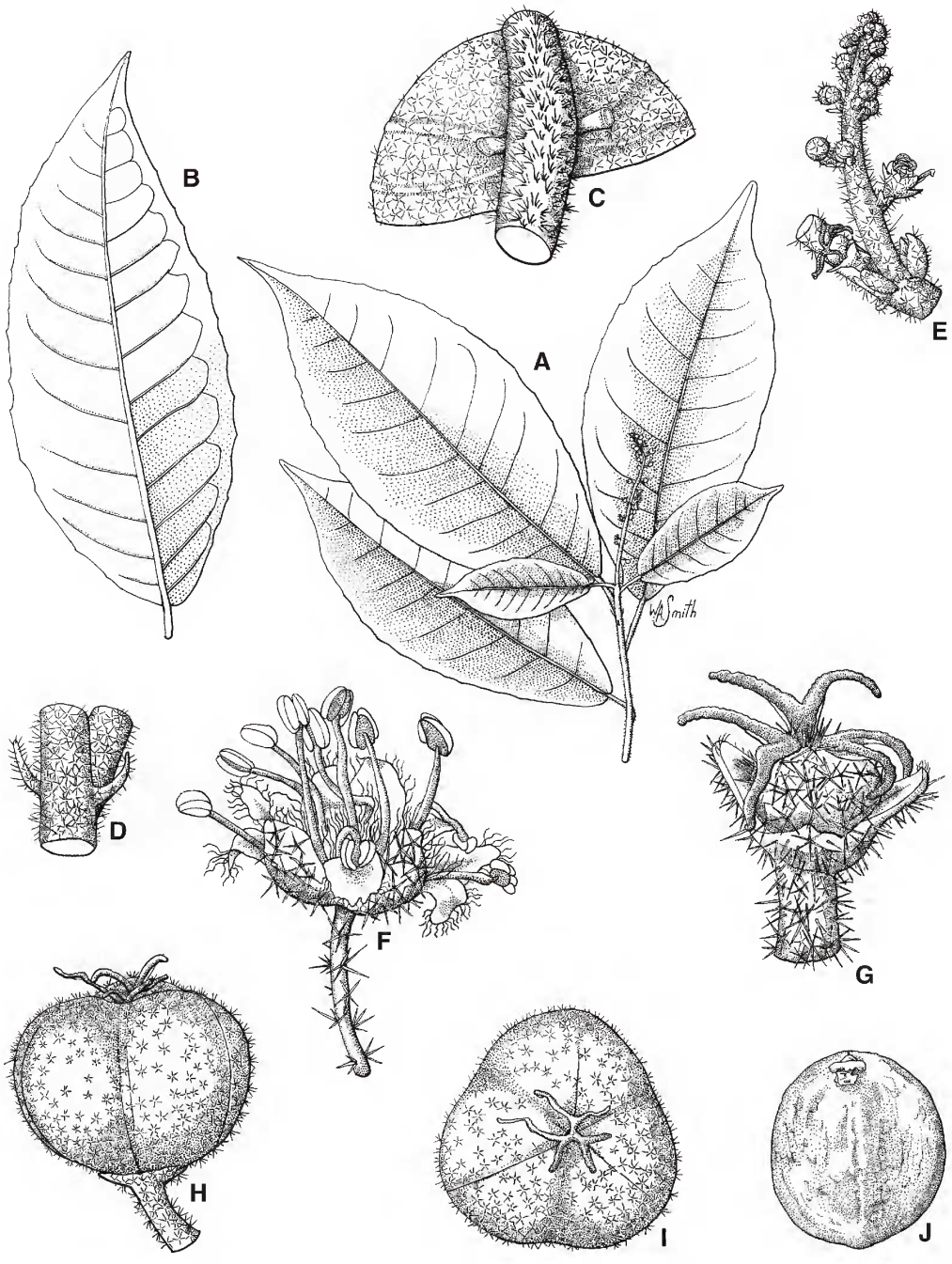


Fig. 10. ***Croton densivestitus***. A. flowering branchlet. × 0.4. B. undersurface of leaf. × 0.6. C. base of leaf lamina showing extrafloral nectaries. × 4. D. node showing stipules. × 4. E. inflorescence with female flowers towards base and male flower buds towards apex. × 2. F. male flower. × 12. G. female flower. × 8. H & I. fruit. × 4. J. seed. × 6. A & F from *Jago* 3068 (BRI); B–E, G–J from *Forster* PIF13740 (BRI). Del. W. Smith.

bridge over North Johnstone River, 17°32'S, 145°55'E, Nov 1982, *Jessup* 509 (BRI, QRS); Russell River, 1892, *Johnson* s.n. (MEL); North Johnstone River, Jun 1985, *Sankowsky* 401 & *Sankowsky* (BRI); Harvey's Creek, Russell River, 1887, *Sayer* s.n. (MEL); Bellenden Ker, Mar 1922, *White* 1291 (BRI); Russell River, 1886, *Sayer* s.n. (MEL); Warramami Hill, Jun 1992, *Tucker* [AQ625430] (BRI, DNA, L, MEL, QRS).

***Distribution and habitat*:** *Croton densivestitus* is restricted to the 'Wet Tropics' of north-eastern Queensland (**Map 5**) where it has been found in two 1° grid squares. Plants generally grow along creeks in lowland notophyll to mesophyll vineforest on alluvium, although there is one disjunct occurrence at 800 m in vineforest on a seasonal watercourse.

***Phenology*:** Flowers have been collected from June to January and fruits in March and July, but it is probable that flowering and fruiting can occur sporadically throughout the year.

***Notes*:** *Croton pubens* was included in the synonymy of *C. densivestitus* by Airy Shaw (1981). No material under this name was received in a loan to BRI from PR, but this does not preclude the existence of type material at that institution. From Domin's original description, there seems little doubt as to the placement of his name here.

Croton densivestitus is distinctive amongst Australian taxa of *Croton* in the dense yellow indumentum of the foliage.

***Conservation status*:** This is a poorly collected plant, although it may be reasonably common in the extant localities. The species is present in Wooroonooran National Park.

***Etymology*:** The specific epithet is derived from the Latin *densus* (dense) and *vestitus* (clothed) and refers to the dense indumentum on the foliage of this species.

12. Croton dockrillii Airy Shaw, Muelleria 4: 227 (1980). **Type:** Queensland. Cook District: Alligator Creek, 12°35'S, 143°24'E, 14 October 1972, *A. Dockrill* 589 (holo: QRS; iso: BRI).

***Illustration*:** Airy Shaw (1981: 619, fig. 2D).

Shrub to 3 m high, monoecious, evergreen, perennial. Indumentum uncoloured. Branchlets rounded, with dense stellate trichomes when young, glabrescent. Stipules linear-lanceolate, 1.5–5 mm long, 0.2–0.8 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 3–26 mm long, c. 1.5 mm wide, with sparse stellate trichomes; lamina elliptic, 30–100 mm long, 20–50 mm wide, penninerved with 10 or 11 lateral veins per side of midrib and reticulate tertiary veins; upper surface dark glossy green, venation not visible, glabrous; lower surface pale green, venation weakly prominent, with scattered stellate trichomes, neither scabrid nor velutinous; margins sinuate to denticulate with 20–28 teeth up to 0.2 mm long, foliar glands prominent; tip acute, short to long acuminate; base cuneate; extrafloral nectaries 2 at base of lamina, stipitate to 1.5 mm, circular, 0.4–0.5 mm long, 0.4–0.5 mm wide, visible above and below. Inflorescence up to 50 mm long, androgynous, pedunculate up to 8 mm; axis with sparse stellate trichomes; bracts lanceolate, 0.7–1.5 mm long, 0.3–0.4 mm wide, with sparse to dense stellate trichomes. Male flowers 3–3.5 mm long, 3.5–4.5 mm diameter, sparsely clustered or held singly towards top of inflorescence; pedicels 2–3 mm long, 0.3–0.4 mm wide, with sparse stellate trichomes; sepals valvate, 5, lanceolate-ovate, 2–2.3 mm long, c. 1.6 mm wide, glabrous, weakly lanate at tip; petals 5, oblanceolate, 2.5–2.8 mm long, 0.7–0.8 mm wide, lanate in upper half; stamens 9–11, filaments filiform, 2.2–2.5 mm long, c. 0.2 mm wide, glabrous, anthers oblong, 0.5–0.6 mm long, 0.4–0.5 mm wide. Female flowers c. 3 mm long, 3–5 mm diameter, held singly and spaced up to 7 mm apart; pedicels 0.5–2 mm long, c. 1 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate to lanceolate-ovate, 2.6–3 mm long, 1–1.5 mm wide, with sparse to dense stellate trichomes; petals absent; styles 3, linear, 2.5–3 mm long, bifid for 1.8–2.6 mm, with scattered stellate trichomes in lower half; ovary 3-locular, 1.7–2 mm long, 1.7–2 mm diameter, with dense, ± sessile stellate trichomes. Fruits trilobate, globose, c. 5 mm long and 5 mm diameter, with sparse, ± sessile stellate trichomes. Seeds ovoid, c. 4 mm long, 4 mm wide, 3.5 mm thick, glossy tan-brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge c. 4 mm long; caruncle truncate-ovate, c. 1–1.2 mm long, 2.3–2.5 mm wide, cream. **Fig. 11**.

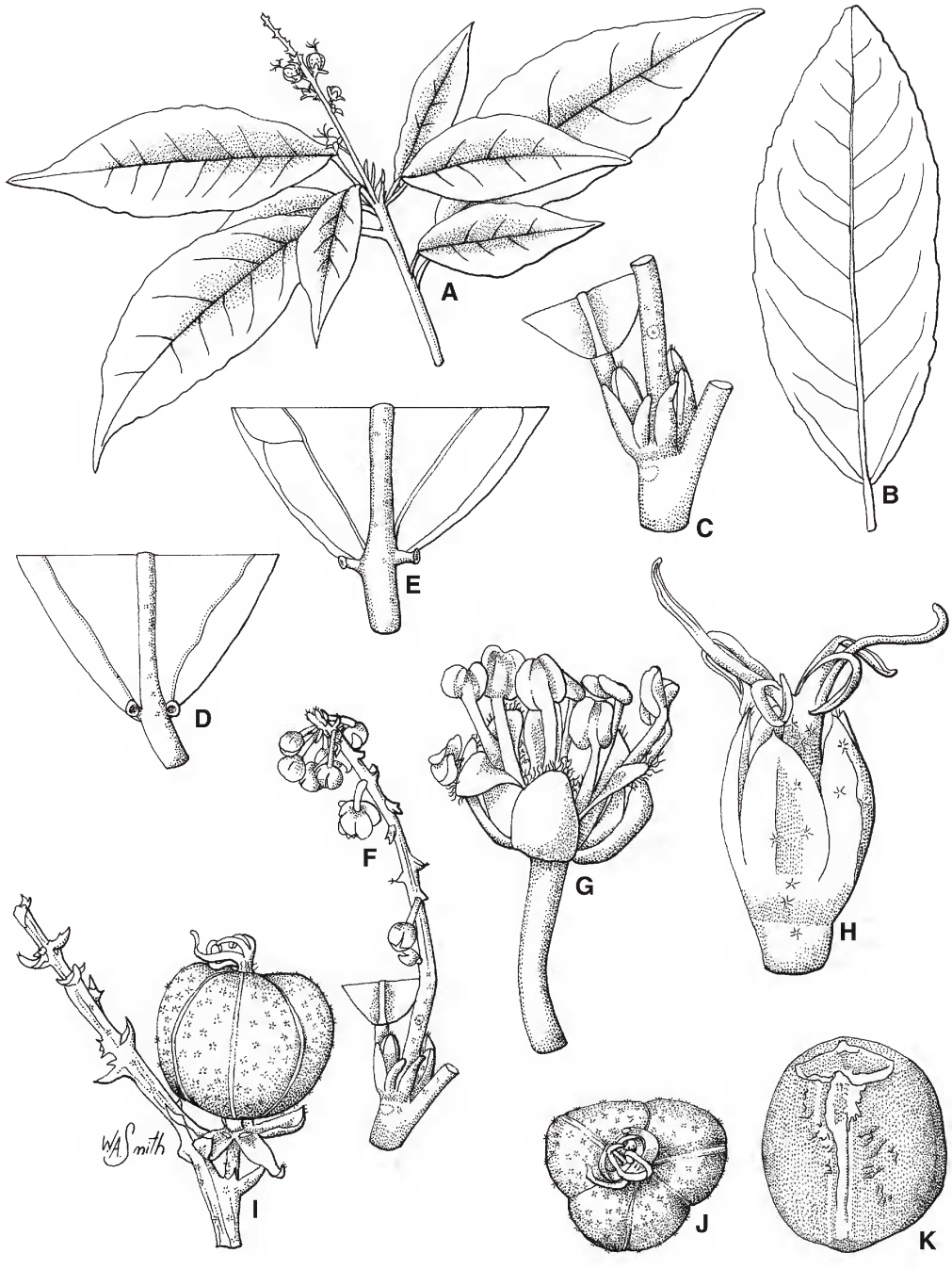


Fig. 11. ***Croton dockrillii***. A. flowering branchlet. × 0.6. B. undersurface of leaf. × 1. C. node with arrangement of stipules. × 3. D & E. base of leaf lamina showing extrafloral nectaries. × 4. F. inflorescence with male flowers. × 2. G. male flower. × 8. H. female flower. × 8. I. fruit on inflorescence. × 4. J. face view of fruit. × 4. K. seed. × 6. A, I–J from *Sankowsky* 1444 (BRI); B & D from *Sankowsky* 1050 (BRI); C, E–H from *Forster* PIF13588 (BRI); K from *Fell* DGF2138 (BRI). Del. W. Smith.

***Additional specimens*: Queensland.** Cook District: King Park, Claudie River, 12°36'S, 143°17'E, Jul 1990, *Fell* DGF2136 (QRS); ditto, *Fell* DGF2137 (QRS); ditto, *Fell* DGF2138 (BRI, QRS); 9 km SW of King Park Ranger Station, Claudie River, 12°46'S, 143°17'E, Apr 1992, *Fell* DGF2495 (BRI, MEL, QRS); Portland Roads, Apr 1944, *Flecker* N.Q.N.C. 8507 (QRS); Rocky River Scrub, eastern fall McIlwraith Range, 13°49'S, 143°27'E, Jun 1992, *Forster* PIF10627 *et al.* (BRI, DNA, K, L, MEL, NSW, QRS); Ham Hill, 12°43'S, 143°18'E, Jul 1993, *Forster* PIF13588 *et al.* (BRI, MEL, QRS); 3 km SSW of Rocky River Crossing, Silver Plains, 13°49'S, 143°27'E, Jul 1993, *Forster* PIF13665 *et al.* (BRI, CANB, MEL, QRS); Rocky River, 13°50'S, 143°25'E, Sep 1973, *Hyland* 6814 (BRI, CANB, QRS); N.P.R. 8, Parish of Weymouth, 12°40'S, 143°21'E, Jan 1982, *Hyland* 11588 (QRS); cult. Forestry & Timber Bureau, Atherton (ex Claudie River), Jan 1975, *Irvine* 1115 (BRI, QRS); cult. Tolga (ex Ham Hill, 12°43'S, 143°19'E), Dec 1989, *Sankowsky* 1050 (BRI, CANB); Iron Range, Sep 1962, *Volck* 2418 (BRI); Galloways Creek, Bamaga, May 1962, *Webb & Tracey* 6083 (BRI).

***Distribution and habitat*:** *Croton dockrillii* is endemic to Cape York Peninsula, Queensland and has been found in the rainforest areas at Cape York, Iron Range and the McIlwraith Range (Map 4) over a total of three 1° grid squares. Plants grow in evergreen notophyll to mesophyll vineforest on volcanic substrates or alluvium. *Croton dockrillii* occurs in association with *C. capitis-york* at some sites and occasional hybrids have been recorded.

***Phenology*:** Flowers have been collected sporadically throughout the year. Fruiting probably occurs two or three months later.

***Notes*:** *Croton dockrillii* is distinctive in the narrow leaves with markedly stipitate glands.

***Conservation status*:** *Croton dockrillii* is uncommon in its known range, but not endangered or threatened at this stage.

***Etymology*:** Named for Alick Dockrill of Atherton, who collected the type specimen.

13. Croton glandulosus L., Syst. Nat. ed. 10, 1275 (1759). *Decarinium glandulosum* (L.) Raf., Neogenyton 1 (1825). **Type:** [Jamaica] *P. Browne*, jam. 346. n. 1 (lecto: LINN 1140.7 *n.v.*; BRI fiche *n.v.*; *fide* Johnston (1959: 182).

***Illustrations*:** Ferguson (1901: plate 16); Small (1913: 454, fig. 2713).

Erect herb to 40 cm high, monoecious, annual. Indumentum uncoloured. Stems rounded, with sparse, sessile and stalked stellate trichomes. Stipules linear-lanceolate, 0.8–1 mm long, c. 0.3 mm wide, entire and with sparse stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 3–25 mm long, 0.7–1 mm wide, with sparse, sessile and stalked stellate trichomes; lamina elliptic to oblanceolate, 5–22 mm long, 4–18 mm wide, palminerved with 5 veins at base and 2 or 3 lateral veins per side of midrib further up the lamina, tertiary reticulate veins obscure; upper surface dark green, venation ± obscure, with scattered stellate trichomes; lower surface pale green, venation weakly visible, with sparse, sessile and stalked stellate trichomes; margins crenate, with 4–7 teeth up to 3.5 mm long, foliar glands inconspicuous; tip acute to obtuse; base cordate to truncate; extrafloral nectaries 2 at top of petiole, sessile, ellipsoid, 0.5–0.8 mm long, 0.4–0.5 mm wide, visible above and below. Inflorescence up to 10 mm long, androgynous, ± sessile; axis with dense, sessile and stalked stellate trichomes; bracts linear, 0.8–1 mm long, 0.1–0.2 mm wide, with dense stellate trichomes. Male flowers c. 1.5 mm long and 1.5 mm diameter, held singly, spaced < 0.5 mm apart; pedicels c. 0.3 mm long and 0.1 mm wide, with dense, sessile and stalked stellate trichomes; sepals valvate, 5, lanceolate-ovate, 0.9–1 mm long and c. 0.5 mm wide, lanate at tip and with sparse, stalked stellate trichomes; petals 5, obovate, c. 0.8 mm long and 0.4 mm wide, lanate; stamens 9–12, filaments flattened, c. 1 mm long and 0.1 mm wide, glabrous, anthers oblong, 0.3–0.4 mm long, 0.3–0.4 mm wide. Female flowers c. 4 mm long and 3 mm diameter, held singly and densely crowded at base of inflorescence, ± sessile; sepals valvate, 5, lanceolate-ovate to obovate, 1.5–4 mm long, 1–1.5 mm wide, with sparse to dense, sessile and stalked stellate trichomes; petals absent; styles 3, linear, 1–1.5 mm long, bifid for c. 1 mm, with sparse sessile stellate trichomes; ovary 3-locular, c. 1 mm long and 1 mm diameter, with dense stellate trichomes. Fruits trilobate, globose, 4–5 mm long, 4–5 mm diameter, with sparse, sessile and stalked stellate trichomes. Seeds oblong, c. 3.5 mm long, 2.8mm wide, 2 mm thick, grey, ventral surface bifacial, dorsal surface rounded, micropylar ridge 2.5–2.8 mm long; caruncle crescent shaped, c. 0.5 mm long and 1.2 mm wide, yellowish. **Fig. 12.**

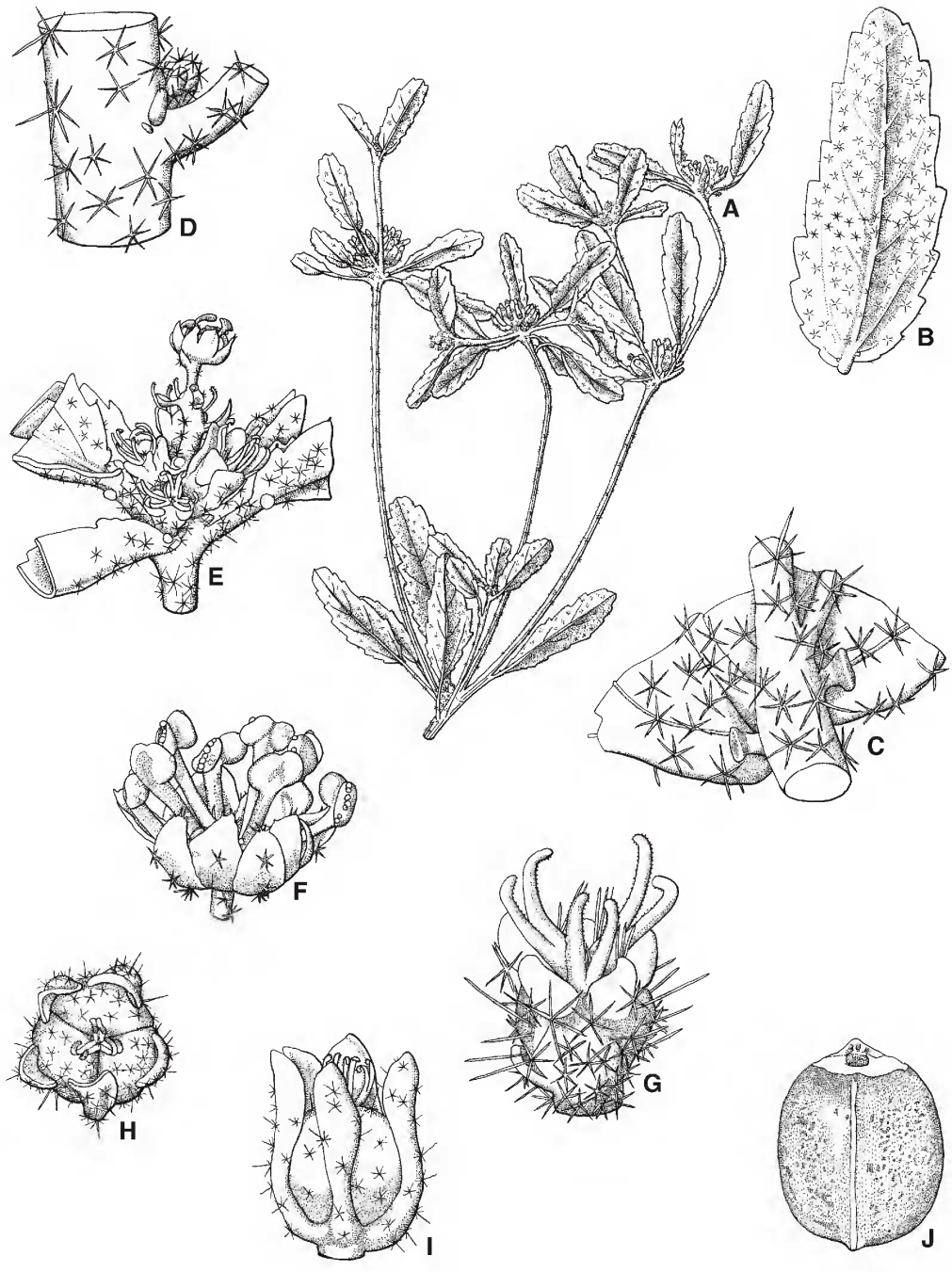


Fig. 12. ***Croton glandulosus***. A. flowering and fruiting branchlets. × 0.6. B. undersurface of leaf. × 2. C. base of leaf lamina showing extrafloral nectaries. × 12. D. node showing stipule. × 8. E. node with inflorescence. × 4. F. male flower. × 12. G. female flower. × 12. H & I. fruit enclosed by calyx. × 4. J. seed. × 8. All from *Forster* PIF28046. Del. W. Smith.

***Additional specimens examined*: U.S.A.** NEW JERSEY: Camden, Aug 1878, *Martindale* AQ206128 (BRI). GEORGIA: College Park, Fulton Co., Apr 1964, *Schallert* 842 (BRI). **Australia, Queensland.** MORETON DISTRICT: Jacobs Well road, Woongoolba, Dec 1994, *Blatch* 1813 (BRI); Jacobs Well, A.Brumm property, 27°47'S, 153°21'E, Dec 2001, *Forster* PIF28046 & *Leiper* (A, AD, BRI, DNA, K, L, MEL, MO, NSW, WIS); Jacobs Well, Apr 2000, *Leiper* [AQ667881] (BRI).

***Distribution and habitat*:** *Croton glandulosus* is native to the U.S.A. where it occurs in the south-eastern and eastern states, through Central America to Brasil (Ferguson 1901; Johnston 1959, 1962). It has been recorded several times from south-eastern Queensland near Jacobs Well (**Map 9**) as a weed in sugar-cane paddocks. Between April 2000 and December 2001, this species had experienced a population explosion at the Jacobs Well locality, with thousands of plants growing in dense swards below a sugar-cane crop.

***Phenology*:** The Australian collection had both flowers and fruits in December.

***Notes*:** Linnaeus (1759) lists "Croton glandulofum Br. jam. 1." in the protologue for *C. glandulosus*. P. Browne donated his Jamaican collections to Linnaeus (Stafleu & Cowan 1981) and the Linnean herbarium (as on the fiche at BRI) has the specimen "Brown. jam. 346. n. 1" which I am equating with being the lectotype of this name as informally designated by Johnston (1959). Several varieties have been recognised for this species based mainly on the density of foliage indumentum (Ferguson 1901; Johnston 1959, 1962).

Webster (1993a) included *C. glandulosus* in *Croton* section *Geiseleria* (Klotzsch) Baill.

***Etymology*:** The specific epithet probably refers to the conspicuous glands on the leaf lamina.

14. Croton habrophyllus Airy Shaw, Kew Bull. 31: 386 (1976). **Type:** Northern Territory. Port Darwin, June 1870, *Schultz* 680 (holo: K *n.v.*, photo at BRI!).

***Illustrations*:** Dunlop *et al.* (1995: 214, Fig. 71); Wheeler (1992: 598, Fig. 182B); Kenneally *et al.* (1996: 100–101).

Small tree or shrub to 4 m high, monoecious, deciduous, perennial. Indumentum silver. Branchlets ± rounded, with dense overlapping stellate trichomes when young, sparse with age. Stipules linear-lanceolate, 0.4–2.2 mm long, 0.1–0.2 mm wide, entire and with scattered stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 3–120 mm long, 0.6–2 mm wide, with scattered to dense stellate trichomes; lamina elliptic, elliptic-ovate or obovate, 15–200 mm long, 7–135 mm wide, with ± penninerved or somewhat palminerved, 9–11 lateral veins per side of midrib and reticulate tertiary veins; upper surface glossy green, lateral venation just visible, with dense stellate trichomes becoming scattered with age; lower surface pale green, venation weakly prominent, with dense stellate trichomes becoming scattered with age, neither scabrid nor velutinous; margins sinuate to denticulate with 35–56 teeth up to 0.5 mm long, foliar glands conspicuous; tip acuminate, acute or rounded; base cordate, rounded or truncate; extrafloral nectaries 2 at lamina base, stipitate to 1 mm, ellipsoid, 0.4–1 mm long, 0.3–0.7 mm wide, visible only below. Inflorescence up to 170 mm long, androgynous or sometimes with glomerules of mixed male and female flowers, pedunculate up to 25 mm; axis with sparse to dense stellate trichomes; bracts linear-lanceolate to lanceolate, 0.7–1.2 mm long, 0.2–0.3 mm wide, with scattered stellate trichomes. Male flowers 2.5–4 mm long, 3–5 mm diameter, held singly or sparsely clustered towards top of inflorescence; pedicels 1.5–6 mm long, 0.3–0.5 mm wide, glabrous or with scattered stellate trichomes; sepals valvate, 5, lanceolate-ovate, 1.8–2.5 mm long, 0.8–1.8 mm wide, glabrous, weakly lanate at tip; petals 5, oblanceolate, 2–3 mm long, 0.5–1 mm wide, lanate at top; stamens 8–12, filaments filiform, 2–2.5 mm long, 0.1–0.2 mm wide, glabrous, anthers oblong, 0.6–0.8 mm long, 0.5–0.7 mm wide. Female flowers 2–4 mm long, 2.2–3 mm diameter, held singly and spaced up to 13 mm apart, or mixed with male flowers; pedicels 1–4 mm long, 0.5–1 mm diameter, glabrous or with sparse stellate trichomes; sepals valvate, 5, lanceolate-ovate, 1.8–2.3 mm long, 1–1.3 mm wide, with scattered stellate trichomes and lanate tip; petals absent; styles 3, obloid-flabellate to linear, 1–2.8 mm long, bifid for 0.5–1.8 mm, connate at base for c. 0.2 mm, glabrous; ovary 3-locular, 1.3–2 mm long, 1.3–2 mm diameter, with dense, sessile stellate trichomes. Fruits trilobate, depressed-globose, 5–6 mm long, 6–7 mm diameter, with sparse, sessile stellate trichomes.

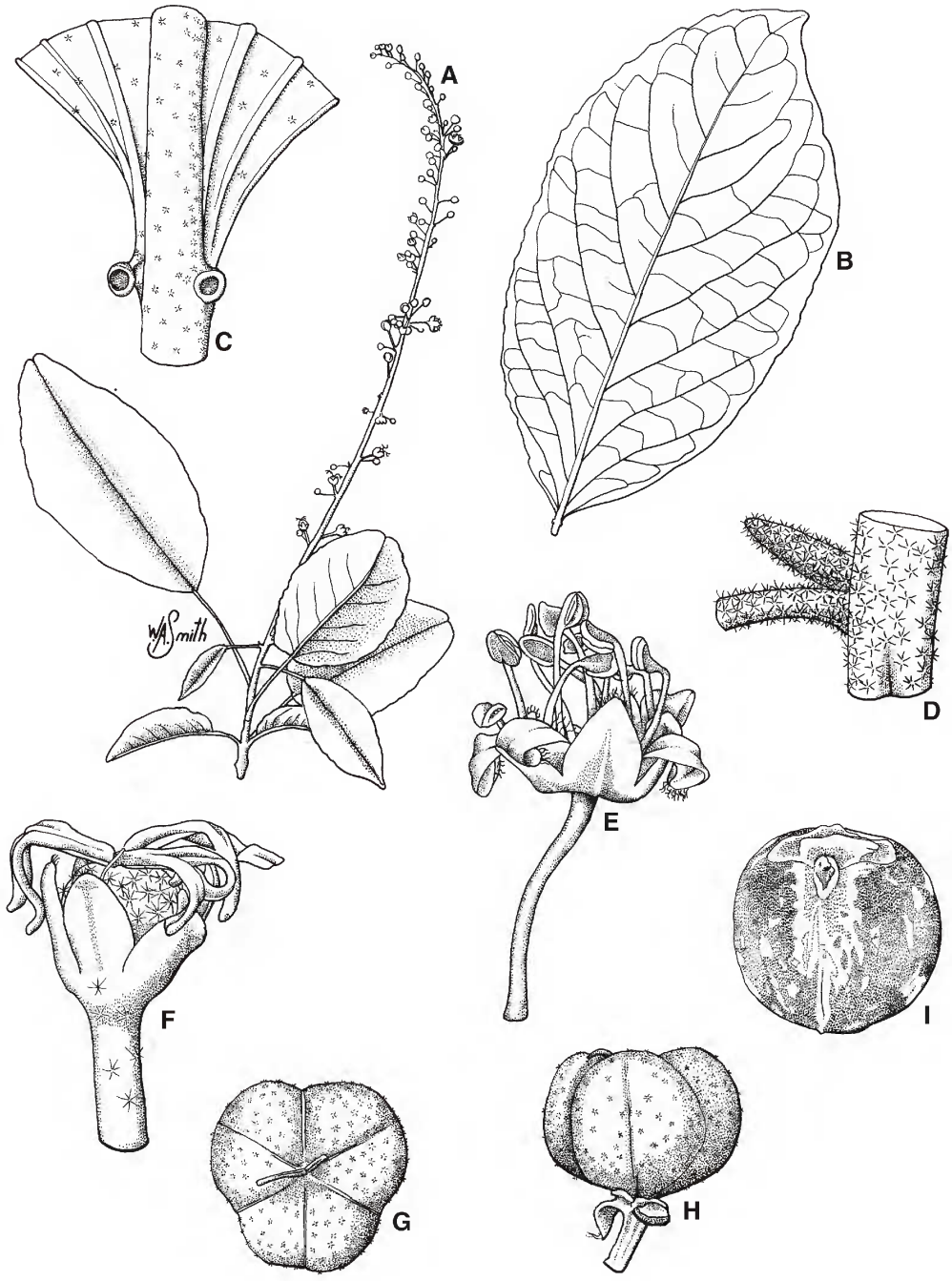


Fig. 13. ***Croton habrophyllus***. A. flowering branchlet. × 0.6. B. undersurface of leaf. × 0.8. C. base of leaf lamina showing extrafloral nectaries. × 8. D. node showing stipule. × 8. E. male flower. × 8. F. female flower. × 8. G & H fruit. × 4. I. seed. × 8. A, D, F from *O'Keefe* 5 (BRI); B, C from *Lucas* 4635 (BRI); E from *Innis* 205 (BRI); G–I from *O'Keefe* AQ454826 (BRI). Del. W. Smith.

Seeds ± obloid, 3.5–4 mm long, 2.6–3.5 mm wide, 2.2–2.5 mm thick, mottled cream and tan-brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge 2–2.8 mm long; caruncle reniform, 0.5–1 mm long, 1–2 mm wide, cream-yellow. **Fig. 13**.

***Selected additional specimens*: Western Australia.** One Arm Point, N. Dampierland, 16°26'S, 123°05'E, Nov 1987, *Carter* 139 (DNA); Cape Leveque, Gnamagun Well, 16°27'S, 122°55'E, Apr 1988, *Dunlop* 7811 (BRI, DNA, MEL); Galen, Dampierland, W of Skeleton Point, 16°32'S, 122°58'E, Jan 1988, *Martin* 207 (BRI, CANB, PERTH). **Northern Territory.** 1 km past Adelaide River on Daly River road, 13°30'S, 131°05'E, Nov 1990, *Cowie* 1405 & *Dunlop* (DNA); Melville Island, Snake Bay, Sand Spear Jungle, Nov 1983, *Dunlop* 6510 & *Wightman* (BRI, DNA, MEL); East Alligator River, 12°50'S, 133°22'E, Dec 1989, *Dunlop* 7628 (BRI, CANB, DNA, MEL); Middle Arm, near Palmerston, 12°34'S, 130°34'E, Nov 1989, *Forster* PIF5942 *et al.* (BRI, DNA, MEL); 3 km W of Nhulunbuy, 12°11'S, 136°45'E, Nov 1989, *Forster* PIF6048 (BRI, DNA); Wessell Islands, 11°11'S, 136°44'E, Sep 1972, *Latz* 3289 (BRI, DNA); North Point, Kapalga, 12°23'S, 132°21'E, Nov 1983, *Russell-Smith* 885 (BRI, DNA); Bennett Bay, Eastern Arnhem Land, 13°42'S, 135°42'E, Nov 1987, *Russell-Smith* 4222 & *Lucas* (BRI, DNA); Mt Ranken, Walker River, 13°35'S, 135°32'E, Oct 1987, *Russell-Smith* 4322 & *Lucas* (BRI, DNA); Cape Wirawawo, Gove, 12°10'S, 136°47'E, Feb 1988, *Russell-Smith* 4635 & *Lucas* (BRI, DNA); Nhulunbuy, East Woody Island, 12°10'S, 136°45'E, Feb 1988, *Wightman* 4128 (BRI, DNA, MEL); Glasswater Creek, Litchfield, 13°18'S, 130°30'E, Oct 1988, *Russell-Smith* 5977 & *Lucas* (BRI, DNA); High Black Range, Moroak, 14°39'S, 133°37'E, Jan 1989, *Russell-Smith* 6614 & *Lucas* (BRI, DNA); Redbank Mine, Wollogorang Station, 17°10'S, 137°46'E, Nov 1984, *Thomson* 763 (BRI, DNA); SW corner Centre Island, Sir Edward Pellew Group, 15°06'S, 136°44'E, Jan 1989, *Thomson* 2946 (BRI, DNA). **Queensland.** Burke District: Louie Creek, 18°48'S, 138°32'E, Dec 1989, *Innis* 205 (BRI); Lawn Hill N.P., 18°45'S, 138°30'E, Dec 1989, *O'Keefe* 10 (BRI).

***Distribution and habitat*:** *Croton habrophyllus* is widespread (twenty-four 1° grid squares) in northern Australia, particularly in the "Top End" of the Northern Territory. There are disjunct populations in the Kimberley region of Western Australia and at Lawn Hill National Park in Burke district in Queensland (**Map 5**). Plants grow in deciduous vinethickets on a variety of substrates, including granite, laterite, sandstone and limestone.

***Phenology*:** Flowering occurs from August to January, especially after storm rains. The plant becomes deciduous for a short period and flowers as the new leaves are expanding. Fruiting occurs from October to April, by which time the leaves are fully expanded.

***Notes*:** This species was placed in the synonymy of *Croton armstrongii* by Airy Shaw (1980c, 1981) and later reinstated by Wilmot-Dear (1987). It is easily distinguished from related species such as *Croton byrnesii*, *C. mutabilis* and *C. rarus* in the silver indumentum and leaves with more marginal teeth (70–112).

***Conservation status*:** *Croton habrophyllus* is common and widespread.

***Etymology*:** The specific epithet is derived from the Greek *habros* (shaggy) and *phyllus* (leaf) and refers to the dense indumentum on the young foliage.

15. Croton insularis Baill., Adansonia 2: 217 (1862), ('insulare'); *Oxydectes insularis* (Baill.) Kuntze, Rev. Gen. Pl. 2: 612 (1891). **Type:** New Caledonia, *Pancher* 360 (lecto: P, *fide* McPherson & Tirel 1987).

***Illustrations*:** Williams (1979: 78); McPherson & Tirel (1987, pl. 15: 1–6); Floyd (1989: 142); James & Harden (1990: 420); Hauser (1992: 88); Logan River Branch S.G.A.P. (Qld Region) Inc. (2002: 221).

Tree or shrub to 15 m high, monoecious, evergreen, perennial; bark lenticellate, cream; blaze pale pink-red; wood straw. Indumentum silver. Branchlets rounded, with dense overlapping peltate scales. Stipules apparently obsolete. Leaves alternate, discolorous, petiolate; petioles 8–18 mm long, c. 1 mm wide, with sparse peltate scales; lamina elliptic, lanceolate-ovate to ovate, 12–100 mm long, 8–45 mm wide, venation obscure; upper surface dark matt green, with sparse peltate scales; lower surface silver, with dense, overlapping peltate scales, neither scabrid nor velutinous; margins entire or somewhat sinuate, foliar glands inconspicuous; tip acute to acuminate; base cuneate to obtuse; extrafloral nectaries 2 at top of petiole, sessile, circular, 0.2–0.5 mm long, 0.2–0.5 mm wide, visible above only. Inflorescence up to 120 mm long, unisexual or androgynous, pedunculate up to 20 mm; axis with dense, overlapping peltate scales; bracts lanceolate-triangular, 0.6–1 mm long, 0.3–1 mm

wide, with dense peltate scales. Male flowers 4–5 mm long, 3–4 mm diameter, held singly or densely clustered towards top inflorescence, spaced up to 3 mm apart; pedicels 2.3–5 mm long, 0.5–1 mm wide, with dense peltate scales; sepals valvate, 4 or 5, lanceolate-triangular, 1.5–2.5 mm long, 1.2–1.6 mm wide, with sparse peltate scales; petals 5, oblanceolate, 1.7–2.6 mm long, 0.6–1 mm wide, lanate; stamens 14–18, filaments filiform, 1.8–4 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.8–1.1 mm long, 0.6–1 mm wide. Female flowers 2.5–3 mm long, 3.5–5 mm diameter, held singly and spaced up to 5 mm apart; pedicels 3–8 mm long, 0.6–1 mm diameter, with dense peltate scales; sepals valvate, 5, lanceolate, 1.8–2.6 mm long, 1–1.6 mm wide, with dense peltate scales; petals absent; styles 3, obloid, 0.8–2 mm long, bifid for 0.5–1.2 mm, connate at base for c. 0.2 mm, glabrous; ovary 3-locular, 1.5–2 mm long, 1.5–2.2 mm diameter, with dense, sessile peltate scales. Fruits trilobate, globose, 7–9 mm long, 5–8 mm diameter, with dense, sessile peltate scales. Seeds ovoid, 3.6–6.5 mm long, 2–3.2 mm wide, 2–2.5 mm thick, brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge 2.3–5.7 mm long; caruncle crescent shaped, 0.5–0.8 mm long, 0.7–1.5 mm wide, cream-yellow. **Fig. 14**.

***Selected additional specimens*: Queensland.** Cook District: S.F. 185 Danbulla, 7 km SW of Hoop Pine Triangle, 17°09'S, 145°35'E, Jan 1993, *Forster* PIF13082 & *Bean* (BRI, L, MEL, QRS); Possum Scrub, Weipa to Stones Crossing road, 12°27'S, 142°09'E, Jul 1993, *Forster* PIF13512 *et al.* (BRI, MEL); Mt Windsor Tableland, S.F. 144, 9 km past Spencer Creek Crossing, 16°18'S, 145°05'E, Jul 1993, *Forster* PIF13703 *et al.* (BRI, MEL, QRS). North Kennedy District: Fern Creek Spring, catchment of Burdekin River, St Pauls Scrub, Mt Cooper Station, 42 km S of Ravenswood, Aug 1989, *Fell* DGF1964 (BRI). South Kennedy District: 26.5 km W of St Anns Homestead, 21°13'S, 146°39'E, Jun 1992, *Thompson* BUC582 & *Sharpe* (BRI). Leichhardt District: Coxens Peak, 22°12'S, 148°27'E, Aug 1990, *Forster* PIF7310 (BRI, MEL, QRS); 17 km from Cracow on Nathan Gorge road, 25°26'S, 150°19'E, Sep 1992, *Forster* PIF11207 & *Sharpe* (BRI, L, MEL, QRS); Palmgrove N.P., Bigge Range, 25°01'S, 149°16'E, Nov 1998, *Forster* PIF23653 & *Booth* (BRI, MEL, QRS). Maranoa District: Chesterton Range, Mt Moffat, NW of Marlong Plain & SW of Mt Sugarloaf, Nov 1990, *Henderson* 3504 & *Robins* (BRI, NSW). Port Curtis District: c. 17 km ESE of Duaringa, 23°46'S, 149°50'E, Sep 1988, *Anderson* 4520 (BRI); Barren Island, SE of Great Keppel Is, 23°10'S, 151°05'E, *Batianoff* 9691 & *Dillewaard* (BRI, NSW). Burnett District: Mt Wooroolin, 26°32'S, 151°48'E, Apr 1990, *Forster* PIF6662 (BRI, L, MEL, QRS); Coominglah Range, S.F.28 Coominglah, 24°51'S, 150°56'E, Nov 1994, *Forster* PIF15908 (BRI, MEL, QRS). Wide Bay District: 5 km SW of Mt Walsh, Coongara Rock road, 25°36'S, 152°00'E, Oct 1990, *Forster* PIF7549 (BRI, K, L, MEL, QRS); Fairlies Knob, 10 km NNE of Brooweena, 25°30'S, 152°17'E, Dec 1990, *Forster* PIF7672 (BRI, MEL, QRS). Darling Downs District: Chinchilla, May 1912, *Beasley* 4 (BRI). Moreton District: end of Steinharts road, Lark Hill, 4 km N of Marburg, 27°32'S, 152°36'E, May 1983, *Forster* PIF1586 (BRI); Splityard Creek, Wivenhoe Dam, 27°23'S, 152°38'E, Nov 1990, *Forster* PIF7612 & *Sharpe* (BRI, DNA, K, L, MEL, MO, QRS); Welk Remnant, Mt Berryman, 27°43'S, 152°18'E, Sep 1999, *Forster* PIF24931 (BRI, QRS). **New South Wales.** 36 miles [60 km] W of Wauchope on Oxley Highway, Aug 1967, *Telford* 58 (CANB).

***Distribution and habitat*:** *Croton insularis* is found in Australia in eastern Queensland from near Weipa in the north, to north-eastern New South Wales in the south (**Map 6**) over a total of forty-four 1° grid squares. As a result it is the third most widespread *Croton,* after *C. arnhemicus* and *C. phebalioides,* in mainland Australia. It also occurs in New Caledonia and Vanuatu (McPherson & Tirel 1987). Plants grow in vinethickets or vineforests on a variety of volcanic substrates.

***Phenology*:** Flowering and fruiting occurs througout the year following rain. The peak flowering period is from October to December.

***Notes*:** *Croton insularis* is easily distinguished from all other taxa of Australian *Croton* by the foliage silver below with totally obscure lateral and interlateral venation. Usually this species is encountered as a shrub up to 5 m tall but at some localities (e.g. Cathu, Windsor Tableland and Bridle Creek State Forests) it may grow up to 15 m tall as a canopy tree.

There is a variant population at Eight Mile Mountain, Emu Creek Station, 9 km NNE of Petford (*Ford* 3668 (BRI); *Forster* PIF28192 *et al.* (BRI, MEL, NSW, WIS)) that appears to be intermediate in vegetative morphology between *C. insularis* and *C. phebalioides*.

***Conservation status*:** *Croton insularis* is very common. It is present in 23 conservation reserves in south-eastern Queensland alone (Forster *et al.* 1991) and four in New South Wales (Floyd 1989).

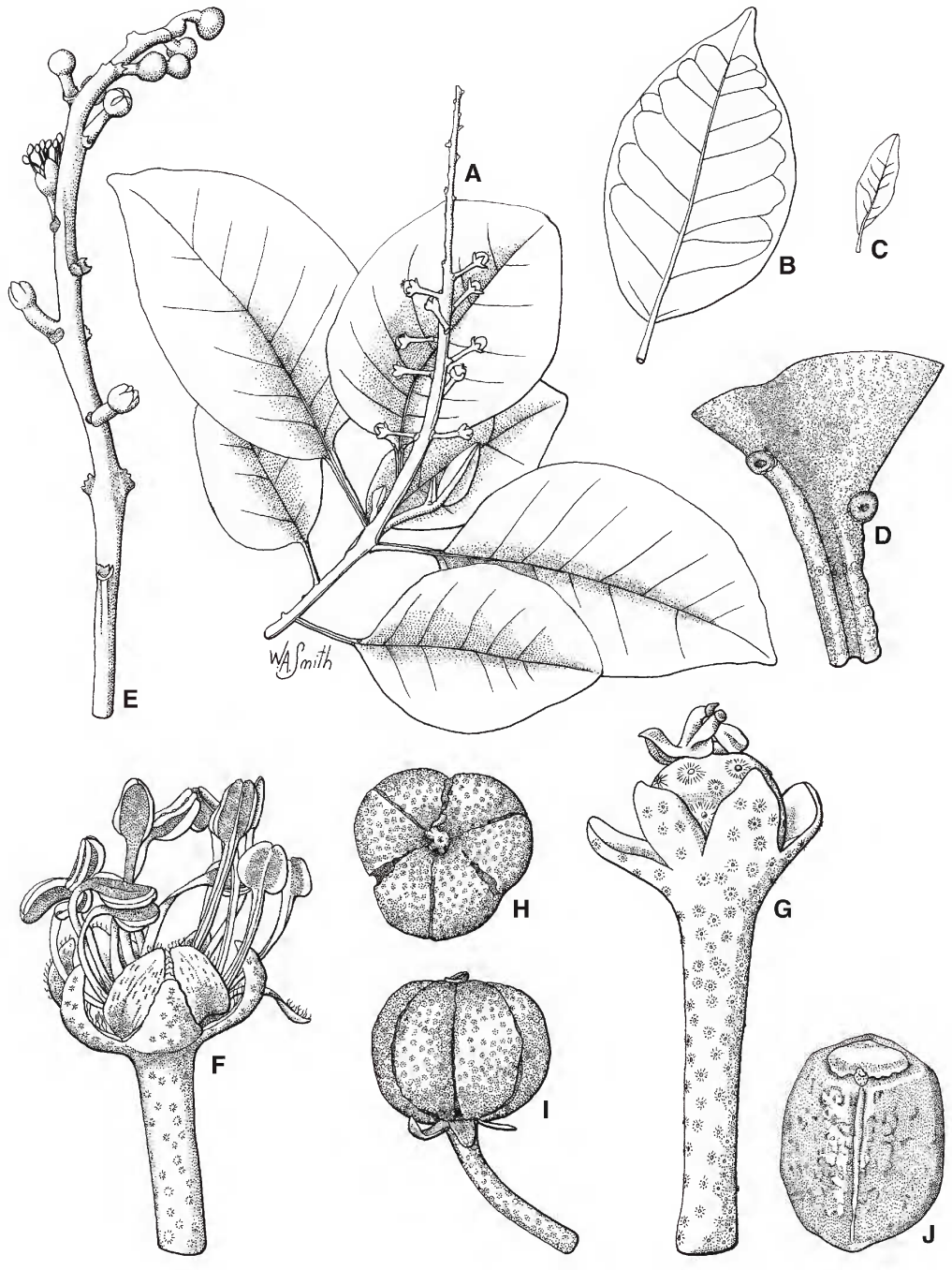


Fig. 14. ***Croton insularis***. A. flowering branchlet. × 0.8. B & C undersurface of leaf. × 0.5. D. base of leaf lamina showing extrafloral nectaries. × 8. E. inflorescence with female flowers in lower half and male flowers in upper half. × 2. F. male flower. × 8. G. female flower. × 8. H & I. fruit. × 4. J. seed. × 8. A, B & G from *Forster* PIF25193 (BRI); C from *Forster* PIF6662 (BRI); D–F from *Forster* PIF7549 (BRI); H–J from *Ryan* 1416 (BRI). Del. W. Smith.

***Etymology*:** The specific epithet refers to the island origin of the type collection.

16. Croton magneticus Airy Shaw, Muelleria 4: 227 (1980). **Type:** Queensland. North Kennedy District: Magnetic Island, 24 July 1938, *D.A. Goy* 329 (holo: BRI).

Small tree or shrub to 5 m high, monoecious, deciduous, perennial. Indumentum ginger to silver. Branchlets ± rounded, with dense stellate trichomes when young, glabrescent. Stipules subulate, 0.3–0.9 mm long, c. 0.2 mm wide, entire and with sparse to dense stellate trichomes. Leaves alternate, petiolate, discolorous; petioles 5–25 mm long, c. 1 mm wide, with dense stellate trichomes; lamina cuneate-obovate, elliptic, elliptic-ovate, 20–115 mm long, 12–60 mm wide, penninerved with 7–9 lateral veins per side of midrib, tertiary reticulate veins obscure; upper surface matt green, venation obscure, glabrous or with scattered stellate trichomes; lower surface silver, lateral veins weakly developed, with sparse to dense, stellate trichomes, scabrid to weakly velutinous; margins denticulate to weakly crenate with 8–24 short teeth up to 2 mm long, foliar glands prominent; tip obtuse to rounded; base weakly cordate, cuneate or truncate; extrafloral nectaries 2 at lamina base, sessile, ellipsoid, 0.6–0.7 mm long, 0.3–0.4 mm wide, visible only below. Inflorescence up to 80 mm long but often reduced to a single flower, often unisexual but occasionally bisexual and androgynous, pedunculate up to 10 mm; axis with dense stellate trichomes; bracts lanceolate to oblanceolate, 1.8–4 mm long, 0.4–1.5 mm wide, with dense stellate trichomes. Male flowers 3–5 mm long, 4.5–5 mm diameter, held singly on inflorescence, spaced up to 2 mm apart; pedicels 2.5–7 mm long, 0.2–1 mm wide, with sparse to dense stellate trichomes; sepals valvate, 5, lanceolate-ovate to obovate, 3–3.5 mm long, 1.8–2.2 mm wide, with dense stellate trichomes; petals 5, obovate, 3–4 mm long, c. 1.5 mm wide, lanate; stamens 15, filaments filiform, 2.2–3 mm long, 0.2–0.5 mm wide, glabrous; anthers oblong, 0.8–1.2 mm long, 1–1.3 mm wide. Female flowers 4–4.5 mm long, 3.5–5 mm diameter, held singly and spaced up to 2 mm apart; pedicels 3–8 mm long, 1–1.2 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate to lanceolate-ovate, 2.3–3 mm long, 1.2–1.8 mm wide, with dense stellate trichomes; petals absent; styles 3, obloid, 1.8–3 mm long, bifid for 1.6–2.8 mm long, connate at base for 0.2 mm, glabrous; ovary 3-locular, 3–4 mm long, 3–4 mm diameter, with dense, stalked stellate trichomes. Fruits trilobate, globose, c. 8 mm long and 8 mm diameter, with dense, stalked stellate trichomes. Seeds obloid-ovoid, 5–5.5 mm long, 4.2–4.5 mm wide, c. 3 mm thick, pale brown, ventral surface bifacial, dorsal surface rounded, micropylar line 4–4.5 mm long; caruncle crescent shaped, 1.5–1.7 mm long, 0.7–1 mm wide, cream. **Fig. 15**.

***Additional specimens*: Queensland.** North Kennedy District: Georges Point, 20°04'S, 148°35'E, Sep 1992, *Batianoff* 9209286 & *Carter* (BRI, MEL); Montes Resort, Cape Gloucester, 20°04'S, 148°27'E, Mar 1994, *Batianoff* 9403250 & *Dillewaard* (BRI); Gloucester Island, E. side, 19°59'S, 148°27'E, Apr 1994, *Batianoff* 94037 & *Figg* (BRI); Gloucester Island, S. end, 20°02'S, 148°26'E, Apr 1994, *Batianoff* 940415G & *Figg* (BRI); Gloucester Island, E. side, 20°01'S, 148°28'E, Apr 1994, *Batianoff* 940443 & *Figg* (BRI); Mt Abbot, 50 km W of Bowen, 20°06'S, 147°43'E, Jul 1992, *Bean* 4734 (BRI); Mt Blackjack, 'Wietalaba', 21°01'S, 147°56'E, Jan 1993, *Fensham* 490 (BRI); 'Havilah', 20°58'S, 147°52'E, Dec 1992, *Fensham* 601 (BRI); 'Fanning River', 19°44'S, 146°27'E, Jan 1993, *Fensham* 731 (BRI); Turtle Creek, SW of Greenvale, 19°18'S, 144°50'E, *Fensham* 914 (BRI); Leichhardt Range, 20°03'S, 147°03'E, Jul 1993, *Fensham* 997 (BRI); West Point, Magnetic Island, 19°07'S, 146°46'E, Jan 1993, *Forster* PIF12761 & *Bean* (BRI, MEL, QRS); 'Wietalaba', 21°01'S, 147°56'E, Jul 1993, *Forster* PIF13408 & *Tucker* (BRI, QRS); ditto, Feb 1994, *Forster* PIF14863 & *Bean* (A, BISH, BRI, CANB, DNA, K, L, MEL, NSW, QRS); Mt Blackjack, Wietalaba Station, 21°00'S, 147°55'E, Jun 1996, *Forster* PIF19197 & *Tucker* (BRI, QRS); Magnetic Island, Jun 1922, *Helms* 1125 (BRI); Balding Bay, Magnetic Island, Aug 1982, *Sandercoe* 751 (BRI); Magnetic Island, Aug 1982, *Sandercoe* 860 (BRI); Magnetic Island, Jun 1983, *Tracey* 14101 (BRI).

***Distribution and habitat*:** *Croton magneticus* is restricted to an area between Greenvale in the north to near Collinsville in the south in north-eastern Queensland (**Map 5**) over seven 1° grid squares. Plants grow in deciduous vinethicket on soils derived from sandstone, granite or acid agglomerate, often in association with *Croton arnhemicus* and *C. phebalioides*.

***Phenology*:** Flowering occurs from December to February following storm or seasonal rains, fruiting occurs from January to March. Dormant buds are held on the plants for much of the year.

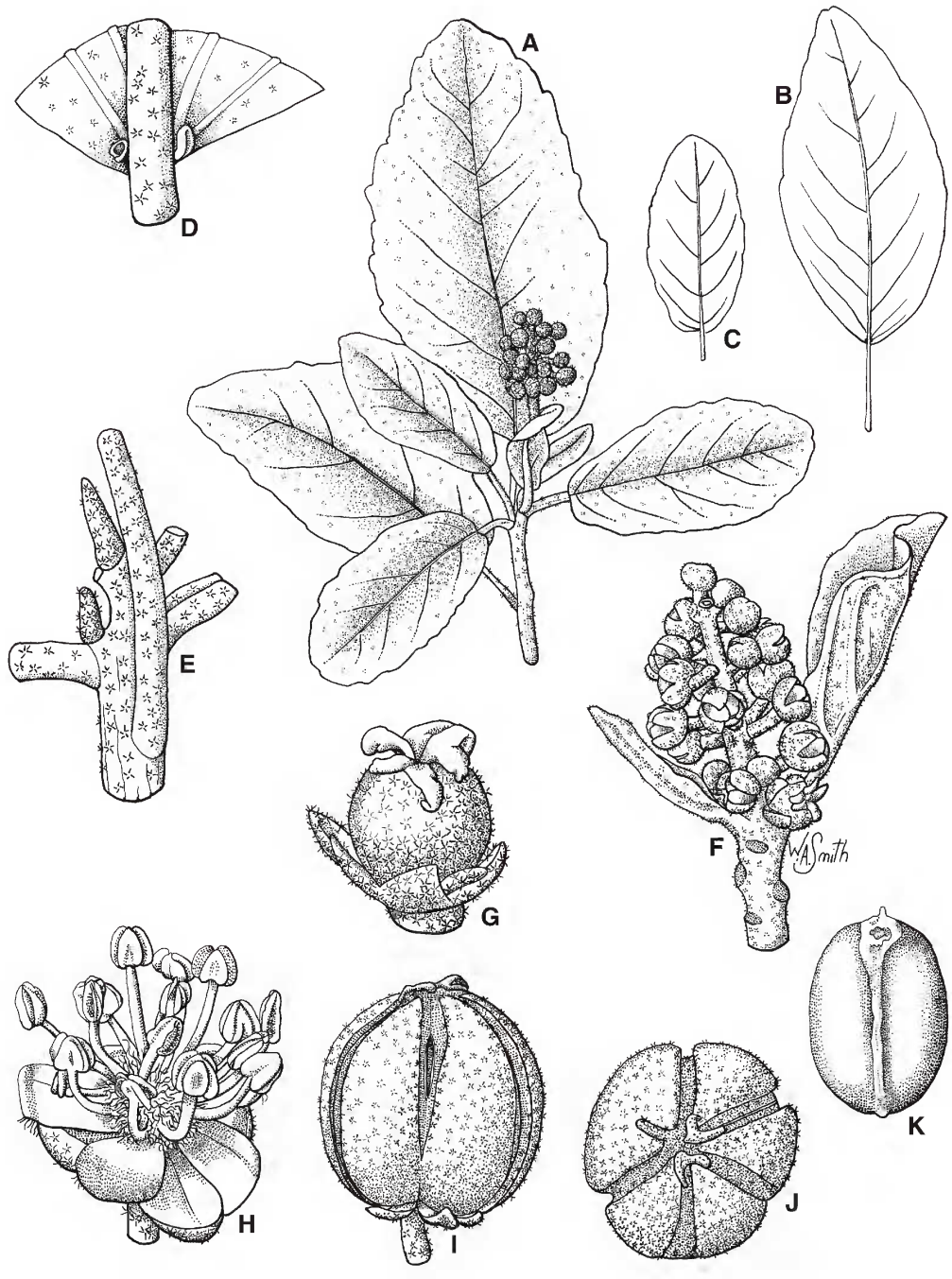


Fig. 15. ***Croton magneticus***. A. flowering branchlet. × 1. B & C. undersurface of leaves. × 0.5. D. base of leaf lamina showing extrafloral nectaries. × 6. E. node showing stipules. × 4. F. inflorescence with female flowers towards base and male flowers towards apex. × 2. G. female flower. × 6. H. male flower. × 6. I & J. dehiscing fruit. × 3. K. seed. × 4. A, C, F–H from *Forster* PIF14863 (BRI); B from *Forster* PIF12761 (BRI); I–K from *Fensham* 490 (BRI). Del. W. Smith.

***Notes*:** *Croton magneticus* is often sympatric with *C. arnhemicus* and sterile collections could possibly be confused with small-leaved forms of that species. *Croton magneticus* is easily distinguished by its penninerved leaves, as opposed to the palminerved leaves of *C. arnhemicus*.

***Conservation status*:** *Croton magneticus* is now known to be much more widespread than was previously thought (Airy Shaw 1981). It is relatively common at the listed localities, but these are disjunct and several may be subject to land clearing. The species is present in the National Park at Magnetic Island and is currently listed as Vulnerable under Queensland Government legislation.

***Etymology*:** The specific epithet refers to the plant's occurrence on Magnetic Island, where it was once thought to be endemic.

17. Croton mamillatus P.I.Forst., **sp. nov.** affinis *C. insulari* autem venatione foliorum ex 12–14 venis lateralibus constanti (vice venatione obscura), pedicellis trichomatis peltatis (vice squamis peltatis) vestitis, floribus masculinis staminibus 9 vel 10 (vice 14–18), fructibus processis mamillatis praeditis trichomatis stellatis vestitis (vice processis emamillatis squamis sessilibus peltatis vestitis) differt. **Typus:** Queensland. Moreton District: Bahr's Scrub, 5 km SSW of Beenleigh, 27°45'S, 153°10'E, 19 December 2001, *P.I.Forster* PIF28049 & *G.Leiper* (holo: BRI [2 sheets + spirit]; iso: A, L, MEL, NE, NSW).

Shrub to 4 m high, monoecious, evergreen, perennial. Indumentum uncoloured to silver. Branchlets ± rounded, with dense peltate trichomes, glabrescent. Stipules shortly lanceolate, c. 0.5 mm long and 0.3 mm wide, entire and with dense peltate trichomes. Leaves alternate, petiolate, discolorous; petioles 3–10 mm long, 1.2–1.5 mm wide, with dense peltate trichomes; lamina elliptic to oblanceolate, 30–70 mm long, 10–32 mm wide, venation penninerved with 12–14 lateral veins per side of midrib, very indistinct, tertiary reticulate veins obscure; upper surface matt dark-green, more glossy when fresh, venation weakly visible, glabrous; lower surface silver-white, lateral veins indistinct, with dense peltate trichomes and peltate scales, neither scabrid nor velutinous; margins ± entire, or very weakly denticulate with barely discernible foliar glands; tip acute to acuminate; base rounded to retuse; extrafloral nectaries absent or if present, then 2, circular, ± sessile, c. 0.3 mm long and 0.2 mm wide, visible above and below. Inflorescence up to 35 mm long, unbranched, androgynous (rarely with male and female flowers mixed in same glomerule), pedunculate up to 12 mm; axis with dense peltate trichomes; bracts shortly lanceolate, 0.5–0.7 mm long, c. 0.3 mm wide, with dense peltate trichomes. Male flowers c. 2 mm long and 3 mm diameter, held singly, spaced up to 1 mm apart, usually towards top of inflorescence; pedicels 2.5–3 mm long, 0.4–0.5 mm wide, with dense peltate trichomes; sepals valvate, 5, lanceolate-ovate to ovate, 1.8–2.2 mm long, 1.4–1.5 mm wide, with dense peltate trichomes; petals 5, obovate, 1.5–2 mm long, 0.6–0.7 mm wide, lanate in upper half; stamens 9 or 10, filaments filiform, 2–2.2 mm long, c. 0.1 mm wide, with dense simple trichomes at base, anthers oblong, 0.6–0.8 mm long, 0.3–0.4 mm wide. Female flowers 3–3.2 mm long, 2.8–3.5 mm diameter, usually held singly and spaced up to 3 mm apart; pedicels 3–4 mm long, 0.8–1 mm diameter, with dense peltate trichomes; sepals valvate, 5, ovate to obovate, 2.5–3 mm long, 1.8–2 mm wide, with dense peltate trichomes, lanate; petals absent; styles 3, linear, 1.2–1.5 mm long, multifid, twice divided for 1–1.2 mm long, connate at base for c. 0.2 mm, glabrous; ovary 3-locular, 1.8–2 mm long, 2.5–2.7 mm diameter, with dense stalked stellate trichomes. Fruits trilobate, weakly depressed-globose, 9–10 mm long, 10–10.5 mm diameter, with dense stellate trichomes on fleshy mamillate protuberances to 1 mm long and 0.5 mm diameter that are topped by a stellate trichome. Seeds oblong, 6–7 mm long, c. 3.5 mm wide, 2.5–3 mm thick, grey-brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge 4.5–5 mm long; caruncle oblong-rectangular, 1.4–1.5 mm long, 0.8–1 mm wide, cream. **Fig. 16**.

***Additional specimens*: Queensland.** Moreton District: Bahr's Scrub, 5 km SW of Beenleigh, 27°45'S, 153°09'E, Feb 2001, *Bean* 17373 (BRI, MEL); slopes of Mt French, SW of Boonah, 28°00'S, 152°37'E, Jan 2002, *Bean* 18336 (BRI); Wolfdene area, 6 km SW of Beenleigh, 27°46'S, 153°10'E, Sep 2002, *Forster* PIF28882 *et al.* (A, BRI, L, MEL, NE, NSW, NY); Bahr's Scrub, Beenleigh, 27°45'S 153°10'E, Jan 2000, *Leiper* [AQ667034] (BRI, QRS); French's Creek road, near Boonah, Jun 1984, *Williams* 84050 (BRI).

***Distribution and habitat*:** This new species is known from only four localities, two near Beenleigh and two near Boonah, all southwest of Brisbane in south-eastern Queensland (**Map 5**) on two 1° grid squares. All populations occur in the understorey of dry rainforest (araucarian microphyll vineforest or notophyll vineforest) amongst rocks, on red soil derived from chert.

***Notes*:** Recognition of this taxon as a new and critically endangered species, is very much due to the keen eye of Glen Leiper who first brought the Bahr's Scrub population to my attention. *Croton mamillatus* appears to have affinities with both *C. insularis* and *C. stigmatosus*, but is immediately distinctive in its spindly habit and the highly mamillate fruit, with the fleshy processes topped by a stellate hair. This feature of mamillate fruit is also present in *Croton capitis-york* and *C. stigmatosus* but is less well developed in those species.

***Conservation status*:** *Croton mamillatus* is known from only four localities, all on private land. The populations at the four localities comprise less than 100 individuals in total. It is likely that the species was once more widespread in the region but that other populations have been destroyed in land clearing over the last 150 years. Plants of *Croton mamillatus* are also rather insignificant, and superficially similar to species such as *C. insularis* or *C. stigmatosus*, so may well have been overlooked by collectors. On present evidence the species should be regarded as critically endangered using the IUCN (2001) categories of A. 1(c), B. 2(a, b (ii, iii), C. 2a(i).

***Etymology*:** The specific epithet *mamillatus* is from the Latin word *mamillatus*, meaning mamillate or having small nipple-like projections, and refers directly to the distinctive fruit of this species.

18. Croton minimus P.I.Forst., **sp. nov.** affinis *C. arnhemico* Muell.Arg. a qua habitu suffrutice usque 30 cm alto, foliis dentibus paucioribus (22–28) et venatione secundaria obscura, et staminibus florum marium paucioribus (16–18) differt. **Typus:** Queensland. Cook District: 11 km from Petford towards Dimbulah, 2.5 km E of Eight Mile Mountain, 17°15'S, 144°58'E, 30 January 1994, *P.I. Forster* PIF14708 (holo: BRI [1 sheet + spirit]; iso: MEL, NSW).

Croton sp. (Mt Mulligan H.Flecker NQNC6457) (Forster & Henderson 1997: 72; Forster & Halford 2002: 70).

Multistemmed subshrub to 30 cm high, monoecious, evergreen, perennial. Indumentum ferruginous-silver. Branchlets rounded, with dense stellate trichomes when young, glabrescent. Stipules linear-lanceolate, 2–5 mm long, 0.4–0.5 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 3–8 mm long, 1–1.2 mm wide, with dense stellate trichomes; lamina broadly ovate to lanceolate-ovate, 10– 40 mm long, 8–25 mm wide, palminerved with 3–5 veins from the base and 3 or 4 lateral veins per side of midrib further up lamina, tertiary reticulate veins obscure; upper surface green-grey, venation obscure, with sparse stellate trichomes; lower surface ferruginous-silver, lateral veins weakly prominent, with dense, stellate trichomes, velutinous; margins irregularly crenate with 11–14 teeth up to 1.5 mm long, foliar glands prominent; tip acute; base cordate to rounded; extrafloral nectaries absent at base of leaf lamina. Inflorescence up to 20 mm long, androgynous, pedunculate up to 6 mm; axis with dense stellate trichomes; bracts linear-lanceolate, 0.8–2 mm long, 0.2–0.3 mm wide, with sparse stellate trichomes. Male flowers 2.5–6 mm long, 2.5–6 mm diameter, densely clustered on inflorescences in glomerules of 1–3 flowers; pedicels 1.4–2.5 mm long, c. 0.5 mm wide, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate to ovate, 1.5–2.5 mm long, 0.9–2 mm wide, with dense stellate trichomes; petals 5, oblanceolate, 2–2.2 mm long, 0.5–1 mm wide, lanate in upper half; stamens 16–18, filaments filiform, 1–3.5 mm long, c. 0.1 mm wide, glabrous; anthers oblong, 0.7–0.8 mm long, 0.4–0.6 mm wide. Female flowers 2.5–3 mm long, 2–2.5 mm diameter, held singly and spaced up to 3 mm apart; pedicels 0.5–0.8 mm long, 0.5–0.6 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate, 1.8–3 mm long, 1–1.8 mm wide, with dense stellate trichomes; petals absent; styles 3, linear 1.8–2 mm long, bifid for 0.8–1 mm, with scattered stellate trichomes in lower half; ovary 3-locular, 1.8–2.6 mm long, 1.5–2.6 mm diameter, with dense,

Fig. 16. ***Croton mamillatus***. A. flowering branchlet. × 0.6. B. undersurface of leaf. × 2. C. base of leaf lamina showing extrafloral nectaries. × 12. D. node showing stipule. × 8. E. node with inflorescence with female flower near base and male flowers near apex. × 1.5. F. male flower. × 8. G. female flower. × 8. H & I fruit. × 3. J. mamillate process on fruit with stellate hairs. × 20. K. seed. × 6. All from *Forster* PIF28049 (BRI). Del. W. Smith.

sessile and stalked stellate trichomes. Fruits trilobate, globose, 6–6.5 mm long, 5–6.5 mm diameter, with dense, sessile and stalked stellate trichomes. Seeds ± ovoid to obloid, 4–4.5 mm long, c. 4 mm wide, 3–3.2 mm thick; dorsal surface rounded, ventral surface bifacial; micropylar line 3.8–4 mm long; caruncle ± reniform, 0.8–1 mm long, 1.2–1.5 mm wide, cream. **Fig. 17**.

***Additional specimens*: Queensland.** Cook District: bank of Hodgkinson River, Mineham's, *Flecker* N.Q.N.C.1165 (BRI); between Mt Mulligan & Thornborough, Dec 1937, *Flecker* N.Q.N.C.6459 (BRI); Chillagoe – Mungana road, c. 200 m SE of Red Dome turnoff, 17°07'S, 144°26'E, Nov 2000, *Ford* AF2484 & *Tucker* (BRI, CANB, K, L, MEL, NE, NSW); N.P.R. 98, near Belgravia Creek, off Burke Development road, Mungana, 17°06'S, 144°24'E, Apr 2002, *Ford* AF3330 *et al.* (BRI, DNA, MEL, NSW); between Eureka Creek & Mt Pinnacle, NNE of Summit, SW of Dimbulah, 17°13'S, 145°03'E, Apr 2002, *Ford* AF3338 & *Sankowsky* (BRI); Mt Pinnacle, SSW of Dimbulah, 17°14'S, 145°03'E, Jan 1993, *Forster* PIF12950 & *Bean* (BRI, MEL); Near Spring Creek Crossing, Mt Carbine to Lakeland Downs road, 16°27'S, 144°50'E, *Forster* PIF18128 & *Spokes* (BRI, MEL); Mungana, near Red Dome Mine turnoff, 17°06'S, 144°25'E, Jan 2002, *Forster* PIF28145 *et al.* (BRI); Eight Mile Mountain, 10.5 km NE of Petford, 17°15'S, 144°59'E, Jan 2002, *Forster* PIF28146 *et al.* (BRI, MEL, NSW, WIS); Eight Mile Mountain, Emu Creek Station, 9.5 km NNE of Petford, 17°15'S, 144°57'E, Jan 2002, *Forster* PIF28196 *et al.* (A, BRI, DNA, L, MEL, NSW, WIS); Richards Creek, Mt Mulligan, 16°52'S, 144°53'E, Nov 1999, *Holmes* 131 (BRI); 3 km from Dimbulah on the Mareeba road, 17°10'S, 145°10'E, Oct 1975, *Hyland* 8472 (BRI, QRS).

***Distribution and habitat*:** *Croton minimus* is known only from west of Dimbulah, around Chillagoe and north of Mt Carbine in north-east Queensland, over three 1° squares (**Map 4**). Plants grow in open forest with *Corymbia clarksoniana* (D.J.Carr & S.G.M.Carr) K.D.Hill & L.A.S.Johnson on skeletal soils derived from granite on steep ridges.

***Phenology*:** Flowering occurs from December to April with fruiting from December to May.

***Notes*:** *Croton minimus* appears to be a miniature derivative of *C. arnhemicus* or *C. multicaulis* that has evolved in response to the xeric environment where it has been found. A comparison of these three species is given in **Table 1**. Both *Croton minimus* and *C. multicaulis* subsp. *velutinus* come into close proximity to one another in the Spring Creek area north of Mt Carbine (vouchers: *Forster* PIF12928 & *Bean*; *Forster* PIF18128 & *Spokes*) and further field work is required to see if the two taxa intergrade.

***Conservation status*:** This species has been rarely collected, but is an inconspicuous plant and vast areas of suitable habitat exist in the known range. Hence it is probable that many more populations can be found once this area is properly explored. No conservation coding is considered necessary.

***Etymology*:** The specific epithet is derived from the Latin *minimus* and refers to the small stature of this plant.

Table 1. Comparison of morphological characters for *Croton arnhemicus*, *C. minimus* and *C. multicaulis*

Character	*C. arnhemicus*	*C. minimus*	*C. multicaulis*
Habit	shrub or tree to 5 m high	subshrub 30cm high	subshrub 1.5m high
no. of marginal teeth on leaf	60–100	22–28	32–56
leaf lamina lateral veins	prominent	weak	prominent
leaf lamina interlateral veins	prominent	obscure	prominent
no. of stamens/ flower	20–44	16–18	11–24

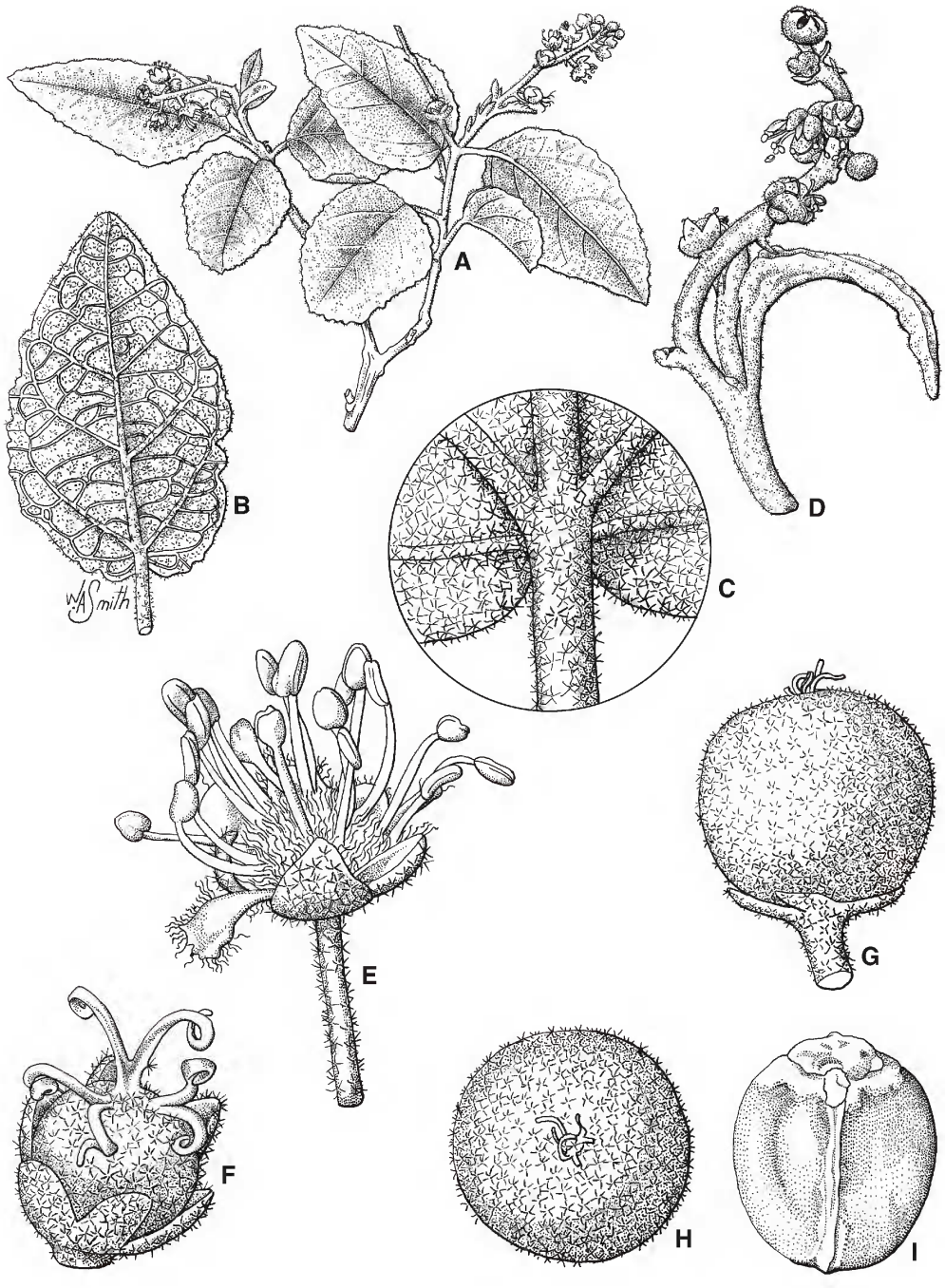


Fig. 17. ***Croton minimus***. A. flowering branchlet. × 1. B. undersurface of leaf. × 1. C. leaf lamina base demonstrating absence of extrafloral nectaries. × 6. D. inflorescence. × 2. E. male flower. × 8. F. female flower. × 8. G & H. fruit. × 4. I. seed. × 6. All from *Forster* PIF14708 (BRI). Del. W. Smith.

19. Croton multicaulis P.I.Forst., **sp. nov.** affinis *C. arnhemico* Muell.Arg. a qua habitu suffrutice multicauli semper, foliis dentibus minus quam 60, et staminibus 11–24 (plerumque minus quam 20) differt. **Typus:** Queensland. Cook District: 20.5 km along Weipa road, off Peninsula Development road, 13°03'S, 142°36'E, 7 December 1993, *P.I. Forster* PIF14367 (holo: BRI [2 sheets + spirit]; iso: DNA, L, MEL).

Croton sp. (Myall Creek P.I.Forster PIF14368) (Forster & Henderson 1997: 72; Forster & Halford 2002: 71).

Multistemmed shrub to 1.5 m high, monoecious, deciduous, perennial. Indumentum ferruginous-silver. Branchlets rounded, with dense stellate trichomes. Stipules linear to linear-lanceolate, 1.2–6 mm long, 0.2–0.6 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 2–40 mm long, 1–1.7 mm wide, with dense stellate trichomes; lamina broadly ovate elliptic, lanceolate-ovate, or ovate, 15–140 mm long, 11–115 mm wide, palminerved with 3–5 veins at base, 4–6 lateral veins per side of midrib further up lamina and tertiary reticulate veins; upper surface matt green, lateral veins weakly visible, with scattered to sparse stellate trichomes; lower surface pale matt green, lateral and tertiary veins prominent, with sparse to dense stellate trichomes and sometimes with stalked yellow glandular trichomes, scabrid to velutinous; margins crenate with 16–28 teeth up to 4 mm long, foliar glands prominent; tip acute to rounded; base cordate, rounded or truncate; extrafloral nectaries absent or 2 at lamina base, sessile or stipitate to 0.8 mm long, circular to ellipsoid, 0.3–2 mm long, 0.2–1 mm wide, visible above and below. Inflorescence up to 150 mm long, usually androgynous, pedunculate up to 45 mm; axis with sparse to dense stellate trichomes; bracts linear to linear-lanceolate, 0.5–4 mm long, 0.2–0.5 mm wide, with dense stellate trichomes. Male flowers 1.8–4 mm long, 2.5–5 mm diameter, held singly on inflorescence or in dense clusters of 1–5 flowers, spaced up to 4 mm apart; pedicels 1.5–7 mm long, 0.3–1 mm wide, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate to ovate, 1.8–3 mm long, 1–2.2 mm wide, with sparse to dense stellate trichomes; petals 5, oblanceolate to obovate, 1.5–3.2 mm long, 0.5–1.5 mm wide, lanate; stamens 11–24, filaments filiform, 1–3.1 mm long, 0.1–0.2 mm wide, with dense simple trichomes at base; anthers oblong, 0.5–1 mm long, 0.4–0.6 mm wide. Female flowers 3–4.5 mm long, 2.5–5 mm diameter, held singly and spaced up to 15 mm apart; pedicels 0.8–6 mm long, 0.8–1.2 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate, 1.7–3 mm long, 0.9–1.8 mm wide, with dense stellate trichomes; petals absent; styles 3, linear, 1.2–3.2 mm long, bifid for 1.1–3 mm long, connate at base for c. 0.2 mm, with scattered stellate trichomes in lower parts; ovary 3-locular, 2–3.5 mm long, 2–3.5 mm diameter, with dense, stalked, stellate trichomes. Fruits trilobate, depressed-globose, 5–8 mm long, 7–8 mm diameter, with dense, stalked, stellate trichomes. Seeds obloid to ovoid, 4–5 mm long, 2.5–4.5 mm wide, 2–3.5 mm thick, black-brown to grey, ventral surface bifacial, dorsal surface ± rounded, micropylar ridge 3–4 mm long; caruncle crescent shaped, 0.6–1.5 mm long, 0.8–3.5 mm wide, cream.

***Distribution*:** *Croton multicaulis* is endemic to north Queensland from the islands of Torres Strait in the north, south to Porcupine Gorge near Hughenden, covering a total of thirteen 1° grid squares.

***Notes*:** *Croton multicaulis* is superficially very similar to *C. arnhemicus* but differs in several ways. *Croton multicaulis* is always a multistemmed subshrub with less than 60 teeth on the margins of the leaf lamina and with 11–24 (mostly less than 20) stamens per flower. *Croton arnhemicus* may persist as a multistemmed subshrub for an indefinite period, but ultimately grows into a small tree, has 60 or more teeth on the margins of the leaf lamina and has 20–44 (mostly more than 28) stamens per flower.

Key to subspecies of *Croton multicaulis*

Foliage scabrid below ..... subsp. **multicaulis**
Foliage soft velutinous below ..... subsp. **velutinus**

19a. Croton multicaulis subsp. **multicaulis**

Foliage scabrid below with sparse stellate trichomes. **Fig. 18**.

***Selected additional specimens*: Queensland.** Cook District: Thursday Island, Jun 1897, *Bailey* [AQ202076] (BRI); c. 18 km NW of Silver Plains Station, 13°52'S, 143°24'E, Nov 1980, *Clarkson* 3614 (BRI); 0.5 km S of Watson River Crossing on the Aurukun to Merluna road, c. 40 km NE of Aurukun, 13°08'S, 142°01'E, Dec 1981, *Clarkson* 4043 (BRI, QRS); Chester River Scrub, eastern fall of McIlwraith Range, 13°40'S, 143°29'E, Jun 1992, *Forster* PIF10400 *et al.* (BRI); Granny Scrub, Weipa to Stones Crossing road, 42 km from Weipa, Jul 1993, *Forster* PIF13500 *et al.* (BRI); Scrubby Creek Scrub, Silver Plains, 13°44'S, 143°28'E, Jul 1993, *Forster* PIF13626 *et al.* (BRI, MEL, NSW); Northern end of Bamboo Range, 14°36'S, 143°27'E, Dec 1993, *Forster* PIF14364 (BRI); Myall Creek Crossing, Weipa road, 12°39'S, 142°16'E, Dec 1993, *Forster* PIF14368 (BRI); Cowal Creek floodplain, Cape York, 10°55'S, 142°18'E, Jun 1994, *Forster* PIF15336 (BRI, QRS); Tragia Scrub, 3.5 km ESE of Mutee Head, Cape York, 10°55'S, 142°16'E, Jun 1994, *Forster* PIF15337 (BRI, QRS); 6.5 km from Captain Billy Landing, 11°37'S, 142°48'E, Jun 1994, *Forster* PIF15361 (BRI, MEL); 27 km SE of Heathlands, 11°52'S, 142°38'E, Feb 1992, *Johnson* 4993 (BRI, DNA, MEL, NSW); Weipa, 3 km E of Lorim Point, 12°41'S, 141°53'E, Jan 1981, *Morton* 1050 (BRI); Herring Oil Slot, Weipa, 12°39'S, 141°50'E, Dec 1989, *O'Reilly* 500 (BRI); Bamaga Mission, 11.2 km SW of Cape York, Oct 1965, *Smith* 12364 (BRI); 5 km ENE of Weipa Mission, 12°38'S, 141°56'E, Jul 1974, *Specht* 347 & *Salt* (BRI); ditto, Dec 1974, *Specht* W43 & *Salt* (BRI); 23.5 km ENE of Weipa Mission, Dec 1974, *Specht* W190 & *Salt* (BRI); Laradeenya Creek, Cape York, Jun 1963, *Stephens* [AQ202078] (BRI); New Mapoon, Northern Peninsula area, 10°52'S, 142°23'E, Jan 1998, *Waterhouse* BMW4785 (BRI).

***Distribution and habitat*:** *Croton multicaulis* subsp. *multicaulis* is endemic to Torres Strait and the northern parts of Cape York Peninsula north of Musgrave (**Map 8**). Plants often grow on the margins of vineforest, but are more common in adjacent *Eucalyptus tetrodonta* F.Muell. woodland on white sandy or red lateritic soils.

***Phenology*:** Flowering occurs from November to July with fruiting two to three months later.

***Conservation status*:** *Croton multicaulis* subsp. *multicaulis* is common throughout its known range; however, no populations appear to be present in conservation reserves at present. No conservation coding is required.

***Etymology*:** The specific epithet is derived from the Latin *multi* (many) and *caulis* (stemmed) and refers to the habit of this plant.

19b. Croton multicaulis subsp. **velutinus** P.I.Forst., **subsp. nov.** affinis *C. multicauli* P.I.Forst. a qua foliis velutinis trichomatibus stellatis densis abaxialiter differt. **Typus:** Queensland. Cook District: 19 km from Laura on road to New Laura homestead, 15°25'S, 144°25'E, 22 January 1993, *P.I. Forster* PIF12829 & *A.R. Bean* (holo: BRI [1 sheet + spirit]; iso: DNA, MEL).

Foliage velutinous below with dense stellate trichomes. **Fig. 19**.

***Selected additional specimens*: Queensland.** Cook District: Musgrave Telegraph Station, s.dat., *Barclay-Millar* [AQ202070](BRI); Little Laura River, SSW of Laura, 15°42'S, 144°17'E, Jul 1990, *Bean* 1905 (BRI); Blue Hills, 49 km from Mt Surprise township, 17°58'S, 144°02'E, Mar 1988, *Champion* 340 (BRI); 0.9 km E of the West Normanby River on the Lakeland Downs to Cooktown road, 15°46'S, 144°59'E, May 1987, *Clarkson* 6754 & *McDonald* (BRI, MBA, QRS); Cape Melville N.P., Altanmoui Range section, 14°30'S, 144°35'E, May 1993, *Fell* DGF3132 & *Stanton* (BRI); 2 km E of Mt Gibson, 16 km SSE of Lakeland Downs, West Normanby River catchment, May 1993, *Fell* DGF3281 & *Daunt* (BRI); Birthday Mt., Rokeby N.P., 23 km N of Coen aerodrome, Aug 1993, *Fell* DGF3522 & *Jensen* (BRI); 31 km from Laura on road to New Laura Homestead, 4 Mile Swamp area, Lakefield N.P., 15°18'S, 144°25'E, Jan 1993, *Forster* PIF12822 & *Bean* (BRI, MEL); New Laura Homestead area, Lakefield National Park, 15°11'S, 144°20'E, Jan 1993, *Forster* PIF12895 & *Bean* (BRI, DNA, MEL); Spring Creek, Mt Carbine to Laura road, 16°22'S, 144°43'E, Jan 1993, *Forster* PIF12928 & *Bean* (BRI, MEL); Lake Emma, Lakefield N.P., 15°17'S, 144°38'E, Jan 1993, *Forster* PIF12939 & *Bean* (BRI, DNA, MEL); Giant Horse Gallery (Laura), 15°40'S, 144°30'E, Mar 1975, *Hyland* 8111 (BRI, QRS); 19.2 km N of Laura, 15°25'S, 144°25'E, Oct 1974, *Robinson* [AQ196265]; Lakefield N.P., 20 km SW of Lakefield Homestead, Aug 1983, *Stanton* [AQ349838] (BRI). BURKE DISTRICT: Porcupine Gorge, 53 km NNE of Hughenden, 20°25'S, 144°26'E, May 1990, *Halford* Q228 (BRI); 55 km NE of Hughenden at Porcupine Gorge N.P. lookout, 20°24'S, 144°26'E, Nov 1992, *Thompson* HUG72 & *Turpin* (BRI, DNA).

***Distribution and habitat*:** *Croton multicaulis* subsp. *velutinus* has been found in the southern part of Cape York Peninsula from near Musgrave south to Lakefield National Park near Laura and has been found in six 1° grid squares (**Map 3**). There are also several apparently disjunct populations at Porcupine Gorge and Mt Surprise

Fig. 18. ***Croton multicaulis*** **subsp.** ***multicaulis***. A. habit of flowering branchlet. × 0.6. B. undersurface of leaf. × 0.8. C. base of leaf lamina showing extrafloral nectaries. × 8. D. node showing stipules. × 8. E. inflorescence with female flowers towards base and male flowers towards apex. × 2. F. male flower. × 6. G. female flower. × 8. H. seed. × 6. A, D–E from *Forster* PIF14368 (BRI); B from *Forster* PIF15361 (BRI); C & H from *Waterhouse* 4785 (BRI); F & G from *Forster* PIF13626 (BRI). Del. W. Smith.

that have been tentatively placed with this taxon. Plants grow in open eucalypt woodland with *Eucalyptus leptophleba* F.Muell. and *Melaleuca viridiflora* Sol. ex Gaertn. on reddish sandy soils or in open eucalypt forest with *Corymbia clarksoniana* and *E. tetrodonta* on red lateritic soils.

***Phenology*:** Flowering occurs from November to July with fruiting two to three months later.

***Conservation status*:** *Croton multicaulis* subsp. *velutinus* is common throughout its known range. Some populations are present in conservation reserves at Lakefield, Porcupine Gorge and Rokeby National Parks.

***Etymology*:** The subspecific epithet is derived from the Latin *velutinus* (velvety) and refers to the dense indumentum on the lower leaf surfaces of this plant.

***Conservation status*:** This subspecies is widespread, and present in at least three National Parks. No conservation coding is required.

20. Croton mutabilis P.I.Forst., **sp. nov.** affinis *C. byrnesii* Airy Shaw a qua indumento ecolorato usque argenteo, foliis sinuatis usque denticulatis dentibus 18–24, venis lateralibus paucioribus (8–10), et petiolis juvenibus trichomatibus dispersis stellate et peltatis differt. **Typus:** Queensland. Cook District: Possum Scrub, road to Stone's Crossing from Weipa, 12°27'S, 142°09'E, 8 December 1993, *P.I. Forster* PIF14376 (holo: BRI [2 sheets + spirit]; iso: DNA, L, MEL, MO, NSW).

Croton sp. (Possum Scrub P.I.Forster PIF14376) (Forster & Henderson 1997: 72; Forster & Halford 2002: 71).

Shrub to 4 m high, monoecious, deciduous, perennial. Indumentum uncoloured or silver. Branchlets ± rounded, glabrous or with scattered stellate trichomes, glabrescent. Stipules linear, 1.8–2 mm long, c. 0.2 mm wide, entire and glabrous. Leaves alternate, petiolate, discolorous; petioles 7–70 mm long, 0.5–1.5 mm wide, with scattered stellate to peltate trichomes when young, glabrescent; lamina elliptic, obovate or ± orbicular, 13–170 mm long, 7–90 mm wide, penninerved with 8–10 lateral veins per side of midrib and tertiary reticulate veins; upper surface dark green, lateral veins weakly developed, glabrous; lower surface pale green, lateral and tertiary veins weakly developed, glabrous or with stellate trichomes, neither scabrid nor velutinous; margins sinuate or denticulate with 9–17 teeth up to 1 mm long, foliar glands prominent; tip acute to rounded; base cuneate, rounded or truncate; extrafloral nectaries 2 at lamina base, sessile, ellipsoid, 0.3–1.3 mm long, 0.2–0.7 mm wide, visible below only. Inflorescence up to 70 mm long, androgynous, pedunculate up to 25 mm; axis glabrous; bracts lanceolate, 0.4–2.5 mm long, 0.2–0.7 mm wide, with scattered simple trichomes and scattered stellate trichomes. Male flowers 2.5–4 mm long, 4–6 mm diameter, held singly or in pairs on inflorescence, spaced up to 5 mm apart; pedicels 3–4 mm long, 0.4–0.7 mm wide, glabrous; sepals valvate, 5, lanceolate-ovate, 2–2.5 mm long, 1.2–1.5 mm wide, lanate on tips; petals 5, oblanceolate, 2–3 mm long, 0.5–1 mm wide, lanate on tips; stamens 10–12, filaments ± flattened, 1.5–2.8 mm long, 0.2–0.3 mm wide, with dense simple trichomes at base; anthers oblong, 0.8–1 mm long, 0.7–0.8 mm wide. Female flowers 3–3.5 mm long, 3.5–4 mm diameter, held singly and spaced up to 10 mm apart; pedicels 2.5–4 mm long, 0.5–0.7 mm diameter, glabrous; sepals valvate, 5, lanceolate-ovate, 2–2.5 mm long, 1–1.3 mm wide, lanate on tips; petals absent; styles 3, linear, 2–2.5 mm long, bifid for 1.1–2.5 mm long, connate at base for c. 0.5 mm, glabrous; ovary 3-locular, c. 2 mm long and 2 mm diameter, with dense, sessile stellate trichomes. Fruits trilobate, depressed-globose, 4–5 mm long, 6–7 mm diameter, with sparse, sessile stellate trichomes. Seeds ± obloid, 3.5–3.8 mm long, 2.8–3 mm wide, 2–2.2 mm thick, glossy brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge 2.5–2.8 mm long; caruncle crescent shaped, c. 1 mm long and 1 mm wide, pale brown. **Fig. 20**.

***Additional specimens*: Queensland.** Cook District: Chester River Scrub, eastern fall of McIlwraith Range, Silver Plains Sation, 13°40'S, 143°29'E, Jun 1992, *Forster* PIF10423 & *Tucker* (BRI); Nesbit River, 13°32'S, 143°31'E, Jun 1992, *Forster* PIF10507 *et al.* (BRI); Massy Creek Scrub, Silver Plains Station, 13°55'S, 143°30'E, Jun 1992, *Forster* PIF10598 *et al.* (BRI, L, MEL, NSW); Stones Crossing, 73 km from Weipa, Jul 1993, *Forster* PIF13506 *et al.* (BRI); Possum Scrub, Weipa to Stones Crossing road, 12°27'S,

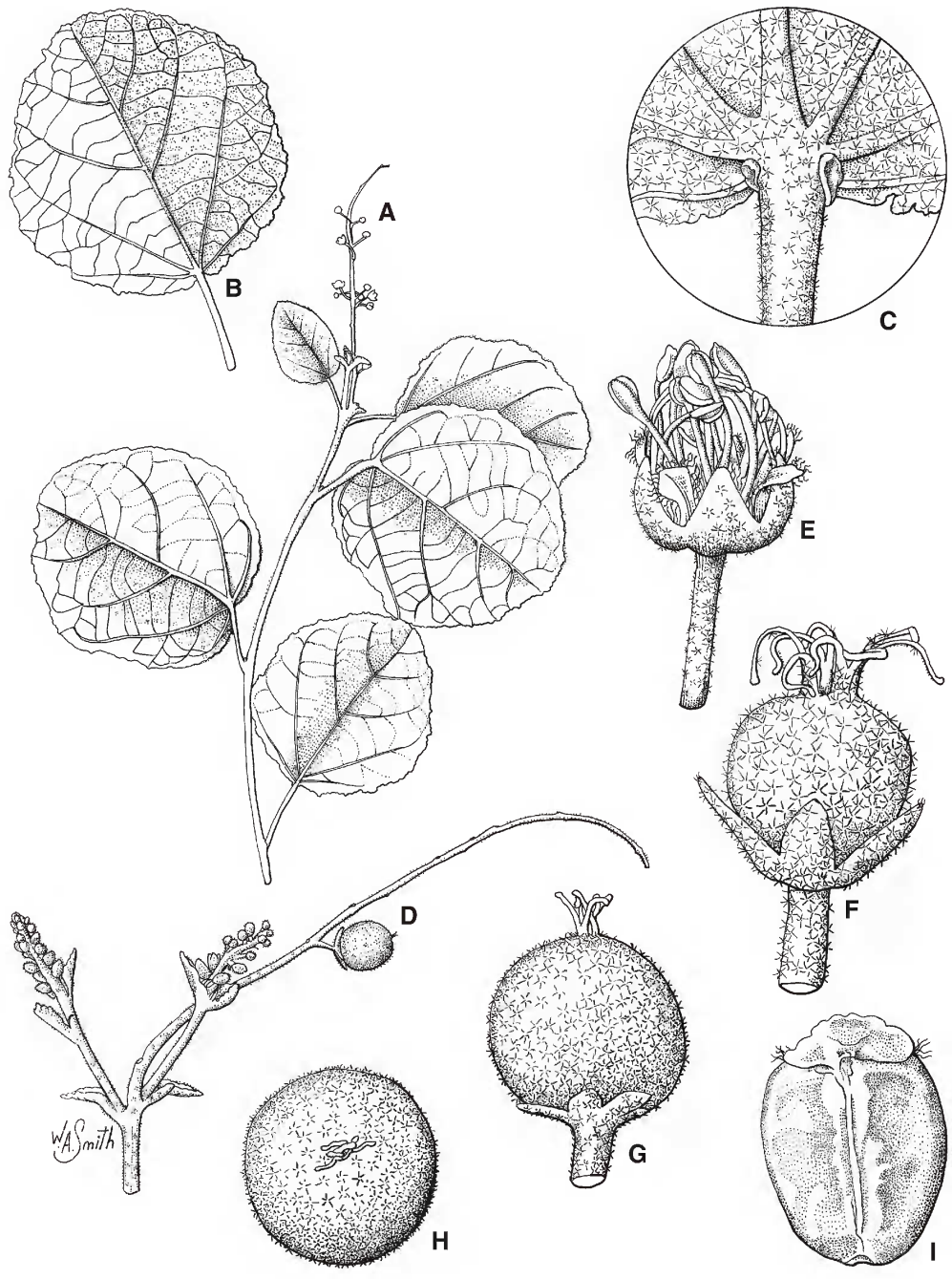


Fig. 19. ***Croton multicaulis*** subsp. ***velutinus***. A. flowering branchlet. × 0.6. B. undersurface of leaf. × 0.8. C. base of leaf lamina showing extrafloral nectaries. × 6. D. inflorescences. × 1. E. male flower. × 6. F. female flower. × 6. G & H. fruit. × 3. I. seed. × 6. A,B from *Forster* PIF12822 (BRI); C–I from *Forster* PIF12829 (BRI). Del. W. Smith.

142°09'E, Jul 1993, *Forster* PIF13515 *et al.* (BRI); Pascoe River crossing, road to Iron Range, 12°53'S, 143°00'E, Jul 1993, *Forster* PIF13532 *et al.* (BRI, QRS); Near Ham Hill (Weymouth Holding), 12°45'S, 143°20'E, Oct 1973, *Hyland* 6990 (BRI, QRS); Claudie River, Oct 1974, *Hyland* 7817 (BRI, QRS); T.R. 14 Massy, 13°52'S, 143°25'E, Nov 1980, *Hyland* 10858 (BRI, QRS); Claudie River, Jan 1982, *Hyland* 11504 (BRI, QRS); ditto, Dec 1982, *Hyland* 12401 (BRI, QRS); cult. Tolga (ex Possum Scrub, Weipa), Nov 1991, *Sankowsky* 1316 & *Sankowsky* (BRI); Nesbit River, Oct 1986, *Tucker* 61 (BRI); Claudie River, Oct 1968, *Webb & Tracey* 8542 (BRI, CANB); between Iron Range airstrip and Portland Roads - Coen road, 12°40'S, 143°23'E, Oct 1968, *Webb & Tracey* 8673 (BRI, CANB).

***Distribution and habitat*:** *Croton mutabilis* is endemic to northern Cape York Peninsula, Queensland and occurs in four 1° grid squares (**Map 9**). Plants grow on the margins of deciduous vine thickets and semi-deciduous notophyll vineforests on alluvium, red laterite or heavy black clay soils.

***Notes*:** Sterile collections of *Croton mutabilis* were misidentified by Airy Shaw (1981) as *C. storckii* Seem. ex A.C.Sm. Smith (1981) reduced *Croton storckii* to the synonymy of *C. microtiglium* Burkill, a species endemic to Fiji.

Croton mutabilis appears to be allied to *C. byrnesii* and *C. habrophyllus*, all three being deciduous and allopatric. *Croton mutabilis* differs from these two species in a number of characters (**Table 2**). While it appears similar to *C. microtiglium* this latter species differs in a number of characters (**Table 3**) and is not necessarily closely related.

Considerable variation occurs in leaf morphology of *Croton mutabilis*. Most collections of this plant have been made in winter when the plants are sterile and the leaves are well developed and turning orange prior to abscission. Flowering occurs following storm rains, when the plant produces flushes of new, and much smaller, foliage.

Conservation status: *Croton mutabilis* is relatively common throughout its known range and is present in Iron Range National Park.

Table 2. Comparison of morphological characters for *Croton byrnesii*, *C. habrophyllus* and *C. mutabilis*

Character	*C. byrnesii*	*C. habrophyllus*	*C. mutabilis*
indumentum colour	ferruginous to yellow	silver	uncoloured silver
leaf lamina margins	crenate	sinuate to denticulate	sinuate to denticulate
no.of marginal teeth per leaf lamina	40–58	70–112	18–24
no. of lateral veins each side of midrib	11–13	9–11	8–10
trichomes on petioles when young	sparse stellate	scattered to dense stellate	scattered stellate & peltate
trichomes on shoot tips or when young	scattered stellate	dense to sparse stellate	glabrous or scattered stellate
stamen filaments	flattened	filiform	flattened

Fig. 20. ***Croton mutabilis***. A. flowering branchlet. × 0.6. B. base of leaf lamina showing extrafloral nectaries. × 6. C. node with stipule. × 6. D & E. undersurface of leaf. × 0.8. F. inflorescence of mainly female flowers. × 1. G. shoot tip with inflorescence of male flowers. × 1. H. male flower. × 8. I. female flower. × 8. J & K. parts of dehisced fruit with seed inside. × 6. L. seed. × 8. A, B, E & F from *Sankowsky* 1316 (BRI); C & D from *Tucker* 61 (BRI); G–I from *Forster* PIF14376 (BRI); J–L from *Hyland* 11504 (BRI). Del. W. Smith.

Table 3. Comparison of morphological characters for *Croton microtiglium* and *C. mutabilis*

Character	*C. microtiglium*	*C. mutabilis*
branchlet indumentum	peltate trichomes	stellate & peltate trichomes
petiole indumentum	peltate trichomes	stellate & peltate trichomes
lateral vein pairs in leaf lamina	9–11	8–10
extrafloral nectaries	poorly formed embedded	well developed, sessile
pedicel indumentum	dense peltate trichomes	glabrous

Etymology: The specific epithet is derived from the Latin *mutabilis* (changeable) and refers to the developmental change in leaf lamina morphology in this species that occurs between flowering and leaf abscission.

21. Croton phebalioides F.Muell. ex Muell.Arg., Flora 47: 485 (1864); *Oxydectes phebalioides* ('phebaliodes') (F.Muell. ex Muell.Arg.) Kuntze, Rev. Gen. Pl. 2: 612 (1891). **Type:** Queensland. North Kennedy District: Burdekin River, *F. Mueller* (holo: K *n.v.*, photo at BRI!).

Croton maidenii R.T.Baker, J. & Proc. Roy. Soc. New South Wales 48: 444, t. 12 (1915). **Type:** New South Wales. Guthrie's Mountain (Read's Mine), 1904, *A.Paddison* (holo: NSW *n.v.*; iso: BRI).

Croton phebalioides var. *acuminatus* Domin, Biblioth. Bot. 89: 326 (1927). **Type:** Queensland. Moreton District: Prope Brisbane River, 1863–1865, *A. Dietrich* 2326 (syn: PR528548); Queensland. North Kennedy District: Edgecombe Bay, *Dallachy* (syn: K *n.v.*, photo at BRI!; MEL231441).

Croton phebalioides var. *typicus* Domin, Biblioth. Bot. 89: 326 (1927), nom. inval. **Type:** same as for *C. phebalioides* F.Muell. ex Muell.Arg.

***Illustrations*:** James & Harden (1990: 420); Hauser (1992: 100).

Shrub or small tree to 8 m high, monoecious, evergreen, perennial. Bark lenticellate, grey; blaze thick, flaky, cream-tan; wood cream-tan. Indumentum uncoloured to silver. Branchlets ± rounded, with dense stellate trichomes. Stipules lanceolate to lanceolate-ovate, 0.3–8 mm long, 0.2–0.5 mm wide, entire and with dense stellate trichomes. Leaves alternate, petiolate, discolorous; petioles 3–16 mm long, 0.8–1 mm wide, with dense stellate trichomes; lamina elliptic, lanceolate or ovate, 8–118 mm long, 3–38 mm wide, penninerved with 7–14 lateral veins per side of midrib, tertiary reticulate veins obscure; upper surface matt dark-green, venation obscure, glabrous or with sparse stellate trichomes; lower surface silver, lateral veins weakly visible, with dense overlapping peltate trichomes, neither scabrid nor velutinous; margins entire, sinuate or denticulate with 11–18 weakly defined teeth less than 0.2 mm long, foliar glands prominent; tip acuminate, acute, obtuse or mucronate; base cuneate; extrafloral nectaries 2 at lamina base, sessile, ellipsoid, 0.1–0.3 mm long, 0.1–0.2 mm wide, visible above only. Inflorescence up to 95 mm long, unbranched, androgynous, pedunculate up to 12 mm; axis with dense stellate to peltate trichomes; bracts lanceolate-ovate to ovate, 0.4–0.8 mm long, 0.2–0.7 mm wide, with dense peltate trichomes. Male flowers 2–3 mm long, 2.5–4.5 mm diameter, held singly or 2 to 3 per glomerule, spaced up to 5 mm apart but usually densely clustered towards top of inflorescence; pedicels 1.5–3.5 mm long, 0.3–0.5 mm wide, with dense peltate trichomes; sepals valvate, 5, lanceolate-ovate to obovate,

1.2–2.7 mm long, 1.3–1.8 mm wide, with dense peltate trichomes; petals 5, obovate, 1.3–3 mm long, 0.5–0.7 mm wide, lanate; stamens 10–12, filaments flattened, 1.6–2.5 mm long, 0.2–0.4 mm wide, glabrous, anthers oblong, 0.8–1.2 mm long, 0.6–1.2 mm wide. Female flowers 2.5–4 mm long, 3–5.5 mm diameter, held singly and spaced up to 15 mm apart; pedicels 2–6 mm long, 0.6–1 mm diameter, with dense peltate trichomes; sepals valvate, 5, lanceolate-ovate to obovate, 2.5–3.5 mm long, 1.5–2.2 mm wide, with dense peltate trichomes, lanate; petals absent; styles 3, flattened-flabellate, 1.2–2.5 mm long, multifid, twice divided for 1–2 mm long, ± free at base, glabrous or sparsely papillose near base; ovary 3-locular, 2–3 mm long, 2.6–4 mm diameter, with dense, sessile and stalked stellate trichomes. Fruits trilobate, depressed-globose, 6–8 mm long, 6.5–9 mm diameter, with dense, sessile and stalked stellate trichomes. Seeds ovoid, 4–5 mm long, 3.2–4 mm wide, 2.3–2.5 mm thick, pale to dark brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge 2.8–3.8 mm long; caruncle broadly ovate, 1–1.2 mm long, 1.4–1.5 mm wide, cream to cream-yellow. **Fig. 21**.

***Selected additional specimens*: Queensland.** Cook District: Mungana, near Red Dome Mine turnoff, 17°06'S, 144°25'E, Jan 2002, *Forster* PIF28144 *et al.* (A, BRI, MEL, WIS); Mt Elephant, Curramore Holding, 16°27'S, 144°56'E, Apr 1987, *Wolfe* 2 (QRS). Burke District: Prairie Creek Gorge, 45 km NNE of Hughenden, Jun 1986, *Murray* 62 & *Morgan* (BRI). North Kennedy District: Mingela Bluff, 19°53'S, 146°45'E, Jan 1992, *Forster* PIF9436 & *Bean* (BRI, K, MEL, QRS); Mt Inkerman, 19°44'S, 147°29'E, Mar 1999, *Forster* PIF24215 (A, AD, BRI, K, L, MEL, QRS). South Kennedy District: Carlisle Is, c. 1 km W of Turtle Bay & c. 35 km N of Mackay, 20°47'S, 149°17'E, Sep 1986, *Sharpe* 4450 & *Batianoff* (BRI). Leichhardt District: Palmgrove N.P., NW of Taroom, 25°01'S, 149°15'E, Nov 1998, *Forster* PIF23808 (BRI, MEL, QRS); Expedition N.P., Amphitheatre section, Cannondale Scrub, 25°12'S, 148°59'E, Nov 1998, *Forster* PIF23869 (BRI, MEL, QRS). Port Curtis District: Mt Etna, 23°10'S, 150°27'E, Nov 1987, *Vavryn* 21 (BRI). Mitchell District: Gowan Range, c. 20 km NNW of Idalia HS, 24°43'S, 144°41'E, Apr 1984, *Purdie* 2071 (BRI). Burnett District: Kalliwa Creek, S.F. 169, St Agnes, 25°18'S, 151°51'E, Dec 1990, *Forster* PIF7717 (BRI, K, L, MEL, MO, QRS); S.F. 695 Kalpowar, Burnett Range road, 24°42'S, 151°20'E, Mar 2000, *Forster* PIF25409 & *Booth* (BRI, MEL, QRS); Coalstoun Lakes N.P., 16 km SW of Biggenden, 25°35'S, 151°54'E, Dec 2002, *Forster* PIF29182 (A, BRI, L, MEL, NE, NSW, WIS). Wide Bay District: Mt Biggenden, 25°32'S, 151°59'E, Jan 1991, *Forster* PIF7738 (BRI, MEL, QRS); Lime Mine road, between Didcot & Coalstoun Lakes, 25°33'S, 151°53'E, Dec 2001, *Forster* PIF28061 (A, BRI, K, L, MEL, WIS). Warrego District: 13 km W of Morven, 26°09'S, 146°59'E, Jun 1978, *Purdie* 766d (BRI). Maranoa District: "Stafford Park", Ulandilla, Jan 1936, *Hewitt* [AQ202176] (BRI). Darling Downs District: "Kilburnie" area, 26°47'S, 150°27'E, Oct 1985, *Hoy* 92(BRI). Moreton District: Ivorys Knob, west slopes, 10 km NE of Boonah at end of Hansens road, Nov 1986, *Bird* [AQ431621] (BRI, NSW). **New South Wales.** Duri Mt, 20 km WSW of Tamworth, 31°12'S, 150°43'E, Nov 2000, *Copeland* 2760 (BRI, NE).

***Distribution and habitat*:** *Croton phebalioides* is widespread in central and southern Queensland with an apparent northern limit at Mt Elephant. It also occurs in north-eastern New South Wales (**Map 8**). It is the most widespread *Croton* in mainland Australia by its presence in fifty-five 1° grid squares. Plants grow in semi-evergreen vinethickets throughout much of the range, although some of the northern populations are present in deciduous vinethicket.

***Phenology*:** Flowering and fruiting occurs throughout the year following storm rains, but is concentrated from September to December.

***Notes*:** *Croton phebalioides* is quite variable in terms of leaf lamina size. Much of this variation appears to be related to aridity, as the populations in drier, more inland localities tend to have smaller leaves than those from nearer the coast.

Although *Croton phebalioides* is usually a shrub, at least one locality it forms a small tree to 8 m high (*Forster* PIF29182).

This species was included in *Croton* section *Croton* by Webster (1993a), but does not conform with the characters given for that section, e.g. the penninerved foliage (versus palminerved) and the 10–12 stamens (versus 15–35).

***Conservation status*:** This is a very common plant and is present in twelve conservation reserves in south-eastern Queensland alone (Forster *et al.* 1991).

***Etymology*:** The specific epithet refers to a resemblance between the foliage of this plant and some species of *Phebalium* (Rutaceae).

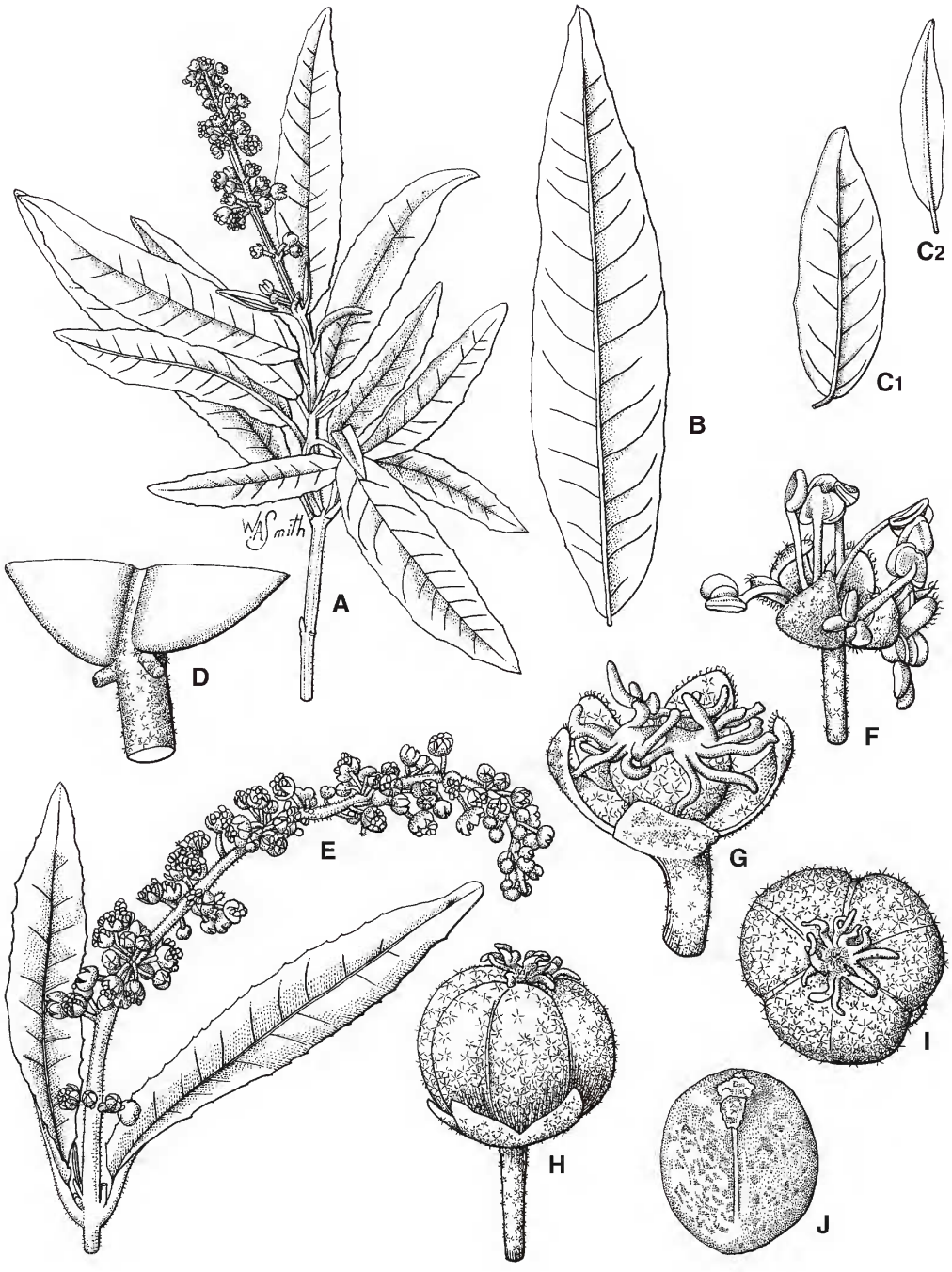


Fig. 21. ***Croton phebalioides*.** A. flowering branchlet. × 1. B & C. undersurface of leaves showing variation in size and primary venation. × 0.8. D. base of leaf lamina showing extrafloral nectaries. × 6. E. inflorescence with male flowers. × 1.5. F. male flower. × 8. G. female flower. × 6. H & I. fruits. × 4. J. seed. × 6. A & F from *Bird* AQ431621 (BRI); B & D from *Forster* PIF7717 (BRI); C1 from *Forster* PIF6571 (BRI); C2 from *Forster* PIF13410 (BRI); G from *Forster* PIF2176 (BRI); H–J from *Gordon* AQ202185 (BRI). Del. W. Smith.

22. Croton rarus P.I.Forst., **sp. nov.** affinis *C. dockrillii* Airy Shaw a qua lamina crenata et venis utroque costae 12–14, indumento ferruginei-argenteo, glandibus foliaribus sessilibus, et pedicello florum marium breviore (1–2 mm longo) differt. **Typus:** Queensland. Cook District: 4.5 km from the Watson River Crossing on the Aurukun - Merluna road, c. 40 km NE of Aurukun, 13°07'S, 141°59'E, 3 December 1981, *J.R. Clarkson* 4062A (holo: BRI [1 sheet]; iso: QRS; DNA, K, L, MO *n.v.*)

Croton sp. (Watson River J.R. Clarkson 4061B) (Forster & Henderson 1997: 72; Forster & Halford 2002: 71).

Shrub to 5 m high, monoecious, evergreen, perennial. Indumentum ferruginous-silver. Branchlets ± rounded, with dense stellate trichomes when young, glabrescent. Stipules linear, 2–3.9 mm long, c. 0.2 mm wide, entire and with sparse to dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 6–30 mm long, 0.7–0.8 mm wide, with dense stellate trichomes; lamina narrowly elliptic to oblanceolate, 20–110 mm long, 10–35 mm wide, penninerved with 12–14 lateral veins per side of midrib and poorly developed tertiary reticulate veins; upper surface dark green, venation not visible, glabrous; lower surface pale green, venation weakly developed, with scattered to sparse, stellate trichomes, neither scabrid nor velutinous; margins crenate with 16–32 teeth up to 0.5 mm long, foliar glands prominent; tip acute to rounded; base cuneate to rounded; extrafloral nectaries 2 at base of lamina, sessile, ellipsoid, 0.7–1 mm long, 0.5–0.6 mm wide, visible mainly below. Inflorescence up to 120 mm long, unbranched, androgynous, pedunculate up to 5 mm; axis with dense stellate trichomes; bracts linear-lanceolate to lanceolate, 1–3.5 mm long, 0.2–0.3 mm wide, with scattered simple and stellate trichomes. Male flowers 3–3.5 mm long, 3–4.5 mm diameter, densely clustered in glomerules of 1–5 flowers towards the top of the inflorescence; pedicels 2.2–2.6 mm long, 0.3–0.4 mm wide, with scattered stellate trichomes; sepals valvate, 5, obovate, 2–2.3 mm long, 1–1.2 mm wide, glabrous; petals 5, oblanceolate, 2.3–2.5 mm long, 0.7–0.8 mm wide, lanate in upper half; stamens 10–12, filaments filiform-flattened, 2.2–3 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.7–0.8 mm long, 0.6–0.7 mm wide. Female flowers 4–4.5 mm long, 3.5–4 mm diameter, held singly or in groups of 2–4 and spaced up to 11 mm apart; pedicels 1–2 mm long, 0.7–1 mm diameter, with sparse stellate trichomes; sepals valvate, 5, lanceolate-ovate, 2–3.5 mm long, 1–2 mm wide, with scattered stellate trichomes; petals absent; styles 3, linear, 2–3.2 mm long, bifid for 1.5–2.5 mm, glabrous, connate at base for c. 0.2 mm; ovary 3-locular, 1.5–2 mm long, 1.8–2.5 mm diameter, with dense, sessile stellate trichomes. Fruits trilobate, globose, 4–5 mm long, 4–4.5 mm diameter, with scattered, sessile stellate trichomes. Seeds ovoid, 3.3–4 mm long, c. 3 mm wide and 2 mm thick, dark-brown, micropylar line 2.2–2.5 mm long; caruncle not seen. **Fig. 22**.

***Additional specimens*: Queensland.** Cook District: Kowanyama, Mitchell River, Mar 1978, *Alpha & Black* 202B (BRI); 4.5 km from the Watson River Crossing on the Aurukun - Merluna road, c. 40 km NE of Aurukun, 13°07'S, 141°59'E, Dec 1981, *Clarkson* 4061B (BRI, QRS); Rokeby N.P., old Archer River crossing, Wenlock, 13°26'S, 142°42'E, Apr 1991, *Fell* DGF2291 (BRI); 12 km along road to Weipa, off Peninsula Development road, 13°04'S, 142°40'E, Jul 1993, *Forster* PIF13478 *et al.* (BRI, MEL, QRS); Stones Crossing, c. 73 km from Weipa, 12°23'S, 142°10'E, Jul 1993, *Forster* PIF13505 *et al.* (BRI); Walkers Creek, Karumba – Normanton road, 17°28'S, 141°10'E, Mar 2001, *Holmes* [AQ498382] (BRI); cult. Tolga (ex Stones Crossing, Wenlock River), Dec 1991, *Sankowsky* 1370 & *Sankowsky* (BRI).

***Distribution and habitat*:** *Croton rarus* is endemic to western Cape York Peninsula, Queensland where it has been collected from near Weipa in the north to Walkers Creek in the south (**Map 4**) over five 1° grid squares. Plants grow in semi-deciduous notophyll vineforest on alluvium along seasonally flooded watercourses, or in one instance in deciduous vinethicket on heavy black clay. *Croton rarus* is sympatric with *C. mutabilis* at some localities.

Notes: *Croton rarus* is closely allied to both *C. byrnesii* from Arnhem Land and *C. dockrillii* from the east coast of Cape York Peninsula. A macromorphological comparison of these three taxa is made in **Table 4**.

Fig. 22. ***Croton rarus***. A. flowering branchlet. × 0.8. B. undersurface of leaf. × 1. C. base of leaf lamina showing extrafloral nectaries. × 8. D. node showing stipules. × 8. E. inflorescence with female flowers towards base, male buds in upper two-thirds. × 1.5. F. male flower. × 8. G. female flower. × 8. H. coccus of dehisced fruit. × 8. I. seed. × 8. A,B,G from *Sankowsky* 1370 (BRI); C & F from *Clarkson* 4061B (BRI); D from *Sankowsky* 1446 (BRI); E from *Clarkson* 4062A (BRI); H & I from *Alpha & Black* 202B (BRI). Del. W. Smith.

Table 4. Morphological comparison of *Croton byrnesii*, *C. dockrillii* and *C. rarus*

Character	*C. byrnesii*	*C. dockrillii*	*C. rarus*
No. lateral veins in leaf lamina	11–13	10–11	12–14
leaf lamina margin	crenate	denticulate to sinuate	crenate
indumentum colour	ferruginous-yellow	clear	ferruginous-silver
foliar glands	sessile to stipitate	stipitate	sessile
male pedicel length	2.5–7 mm	2–3 mm	1–2 mm
styles divided	twice	once	once
fruit shape	depressed-globose	globose	globose

***Conservation status*:** *Croton rarus* is an uncommonly collected plant but is likely to be more widespread than the available collections would indicate. There are no immediate threats to this species and no conservation coding is thought necessary. The species has been recorded from Rokeby National Park.

***Etymology*:** The specific epithet is derived from the Latin *rarus* (scattered or rare) and alludes to the distribution and apparent paucity of this species.

23. Croton schultzii Benth., Fl. Austral. 6: 124 (1873). **Type:** Northern Territory. Port Darwin, June 1870, *Schultz* 609 (holo: K *n.v.*, photo at BRI!).

[*Croton argyratus* auct., non Blume; Brock (1988: 129); Dunlop *et al.* (1995); Wheeler (1992: 597)].

***Illustrations*:** Brock (1988: 129); Dunlop *et al.* (1995: 214, Fig. 71); Wheeler (1992: 598, Fig. 182A).

Shrub to 4 m high, monoecious, seasonally deciduous, perennial. Indumentum silver. Branchlets ± rounded, with dense overlapping peltate scales when young, glabrescent. Stipules linear-lanceolate, 3–6 mm long, 0.3–mm wide, entire and with dense peltate scales. Leaves alternate, discolorous, petiolate; petioles 20–60 mm long, 0.8–1 mm wide, with dense peltate scales; lamina elliptic to broadly ovate, 20–120 mm long, 15–100 mm wide, palminerved with 1 or 2 veins per side from base and with 6–10 lateral veins per side of midrib, tertiary reticulate veins obscure; upper surface dark green, lateral veins not visible, ± glabrous or with scattered peltate scales, glabrescent; lower surface irridescent silver, lateral veins weakly visible, with dense, overlapping, peltate scales, neither scabrid nor velutinous; margins entire or weakly sinuate, foliar glands inconspicuous; tip acute to short acuminate; base cordate; extrafloral nectaries absent, or if present then 2 at base of lamina, sessile, ellipsoid, 0.4–0.6 mm long, 0.2–0.5 mm wide, visible below only. Inflorescence up to 70 mm long, unbranched, usually androgynous, pedunculate up to 10 mm; axis with dense peltate scales; bracts lanceolate, 1–2.8 mm long, 0.2–0.8 mm wide, with dense peltate scales. Male flowers 3–4 mm long, 3–4 mm diameter, densely clustered towards the inflorescence tip; pedicels 2–4 mm long, 0.4–0.5 mm wide, with dense peltate scales; sepals valvate, 5, lanceolate to lanceolate-ovate, 2.5–2.8 mm long, 1–1.6 mm wide, with dense peltate scales; petals 5, lanceolate, 2.3–4 mm long, 0.8–1.5 mm wide, lanate in upper half and with sparse simple hairs on abaxial surface; stamens 10, filaments ± flattened, 2–3 mm long, c. 0.2 mm

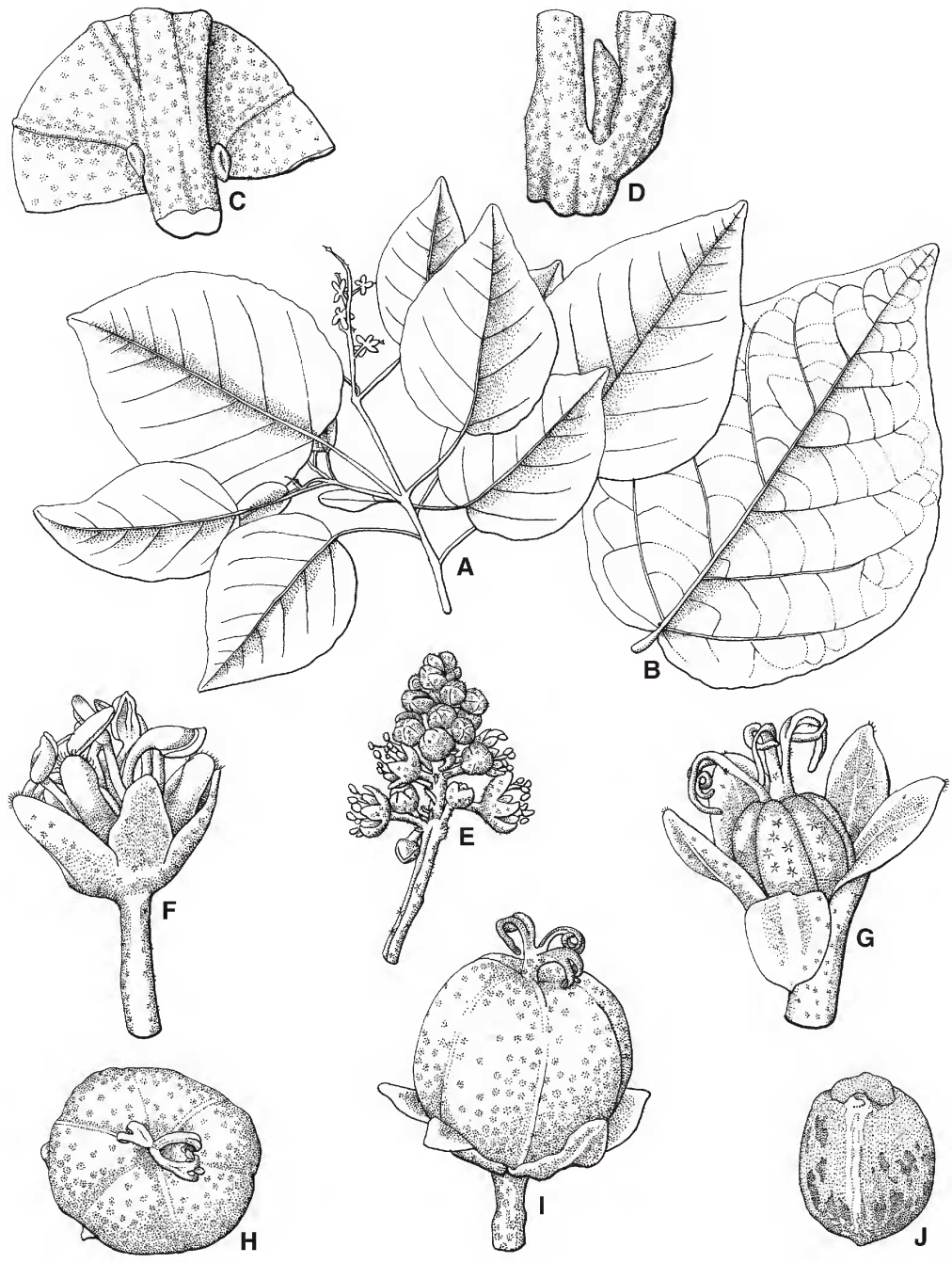


Fig. 23. ***Croton schultzii***. A. fruiting branchlet. × 0.4. B. undersurface of leaf. × 1. C. base of leaf lamina howing extrafloral nectaries. × 8. D. node showing stipule. × 6. E. inflorescence with male flowers. × 2. F. male flower. × 6. G. female flower. × 6. H & I. Fruit. × 4. J. seed. × 4. A,B,J from *Brock* 209 (BRI); C, H & I from *Cowie* 8781 (BRI); D & G from *Leach* 2695 (BRI); E & F from *Russell-Smith* 8123 (BRI). Del. W. Smith.

wide, glabrous; anthers oblong, 0.8–1 mm long, 0.5–0.7 mm wide. Female flowers 3–4.5 mm long, 3–4 mm diameter, held singly 5–15 mm apart; pedicels 2–8 mm long, 0.8–1 mm diameter, with dense peltate scales; sepals valvate, 5, lanceolate-obovate, 3–5.5 mm long, 1.5–2.5 mm wide, with dense peltate scales; petals absent; styles 3, linear to obloid, 2.6–4 mm long, bifid for 1.5–2 mm long, connate at base for c. 0.3 mm, glabrous apart from sparse peltate scales at base; ovary 3-locular, 2–3 mm long, 2–3 mm diameter, with dense peltate scales. Fruits trilobate, globose, 6–8 mm long, 7–8 mm diameter, with sparse peltate scales. Seeds ± obloid, c. 5.5 mm long, 4–4.8 mm wide, 2–2.8 mm thick, irregularly blotched brown and cream, ventral surface bifacial, dorsal surface rounded, micropylar ridge 4–4.8 mm long; caruncle crescent shaped, c. 1 mm long, 2.3–2.5 mm wide, cream. **Fig. 23**.

***Selected additional specimens*: Western Australia.** Near Cape Bernier, 14°06'S, 127°32'E, Jun 1988, *Hyland* 13538 (QRS). **Northern Territory.** East Point, Feb 1987, *Brock* 209 (BRI, DNA); East Point, 12°25'S, 130°49'E, Nov 1967, *Byrnes* 284 (DNA); Gunn Point, Nov 1990, *Cowie* 1444 & *Dunlop* (BRI, DNA, MEL); Gunn Point, 12°10'S, 131°02'E, May 1984, *Dunlop* 6706 & *Wightman* (DNA); East Point, Dec 1990, *Dunlop* 8781 & *Cowie* (BRI, DNA); Gunn Point, Nov 1989, *Forster* PIF5918 & *Russell-Smith* (BRI, DNA, MEL); Mt Briggs, Fish River Station, Mar 1989, *Leach* 2512 & *Dunlop* (BRI, DNA); Gunn Point, Feb 1990, *Leach* 2695 & *Dunlop* (BRI, CANB, DNA); Lee Point, Darwin, 12°26'S, 131°50'E, Aug 1984, *Russell-Smith* 1147 (DNA); Murganella, Wunya Beach, 11°42'S, 133°09'E, Mar 1987, *Russell-Smith* 1957 & *Lucas* (DNA); Melville Island, Condor Point, 11°44'S, 131°17'E, May 1987, *Russell-Smith* 2390 & *Lucas* (DNA); 3 km W Mt Muriel, Tipperary, 13°54'S, 131°10'E, Mar 1989, *Russell-Smith* 7981 & *Lucas* (BRI, DNA); Gunn Point, Nov 1989, *Russell-Smith* 8123 & *Lucas* (BRI, DNA).

***Distribution and habitat*:** *Croton schultzii* is endemic to Australia occuring in a few localities near Darwin in the Northern Territory and the Kimberley region in Western Australia (**Map 3**). Its distribution covers nine 1° grid squares. Plants grow in deciduous vinethicket on red laterite or limestone.

***Phenology*:** Flowering occurs from November to January, following storm rain. There is one record from June, but this is considered abnormal. Fruiting occurs from December to March.

***Notes*:** *Croton schultzii* has been referred to in recent times as *C. argyratus* (Wheeler 1992; Dunlop *et al.* 1995; Chakrabarty & Balakrishnan 1997). It is not conspecific with that species and differs in the peltate scales on the foliage (versus peltate trichomes), the male flowers with shorter pedicels (2–4 mm versus 5–6 mm), the smaller fruit (6–8 mm diameter versus 12–16 mm) and smaller seeds (c. 5.5 mm long x 4–4.8 mm wide, versus 10–11 mm long x 7–8 mm wide). *C. argyratus* is restricted to peninsular Thailand, the Malay Peninsula, Sumatra, Java, Borneo and the Lesser Sunda Islands (H.-J.Esser pers. comm. 2000), although it has also been recorded for India in the Andaman and Nicobar Islands (Chakrabarty & Balakrishnan 1997).

***Conservation status*:** The species is common at the known localities.

***Etymology*:** The name honours M. Schultz (date of birth & death unknown), who collected specimens at Port Darwin as cited by Bentham in the 'Flora Australiensis'.

24. Croton setigerus Hook., Fl. Bor.-Amer. 2: 141 (1838); *Eremocarpus setigerus* (Hook.) Benth., Bot. Voy. Sulph. 53, t. 26 (1844). **Type:** U.S.A., California, *Douglas* (holo: K *n.v.*, photo at BRI!).

***Illustrations*:** James & Harden (1990: 420); Webster (1993b: 575); Jeanes (1999: 67, Fig. 10b); Radcliffe-Smith (2001: 325, Fig. 40).

Prostrate to semi-erect herb to 20 cm high, monoecious, annual. Indumentum ferruginous-silver. Branchlets rounded, with dense stellate trichomes. Stipules linear-subulate, 5–7 mm long, 0.2–0.5 mm wide, multifid and with dense stellate trichomes. Leaves alternate, petiolate, discolorous; petioles 3–45 mm long, c. 1 mm wide, with dense stellate trichomes; lamina ovate to suborbicular, 8–65 mm long, 8–40 mm wide, palminerved with 3–5 lateral veins from base, tertiary reticulate veins obscure; upper surface silver-green, venation obscure, with dense stellate trichomes; lower surface silver, venation obscure, with dense stellate trichomes; margins entire, foliar glands absent; tip acute to rounded; base cuneate to rounded; extrafloral nectaries absent. Inflorescence up to 15 mm long, unbranched, androgynous, ± sessile; axis

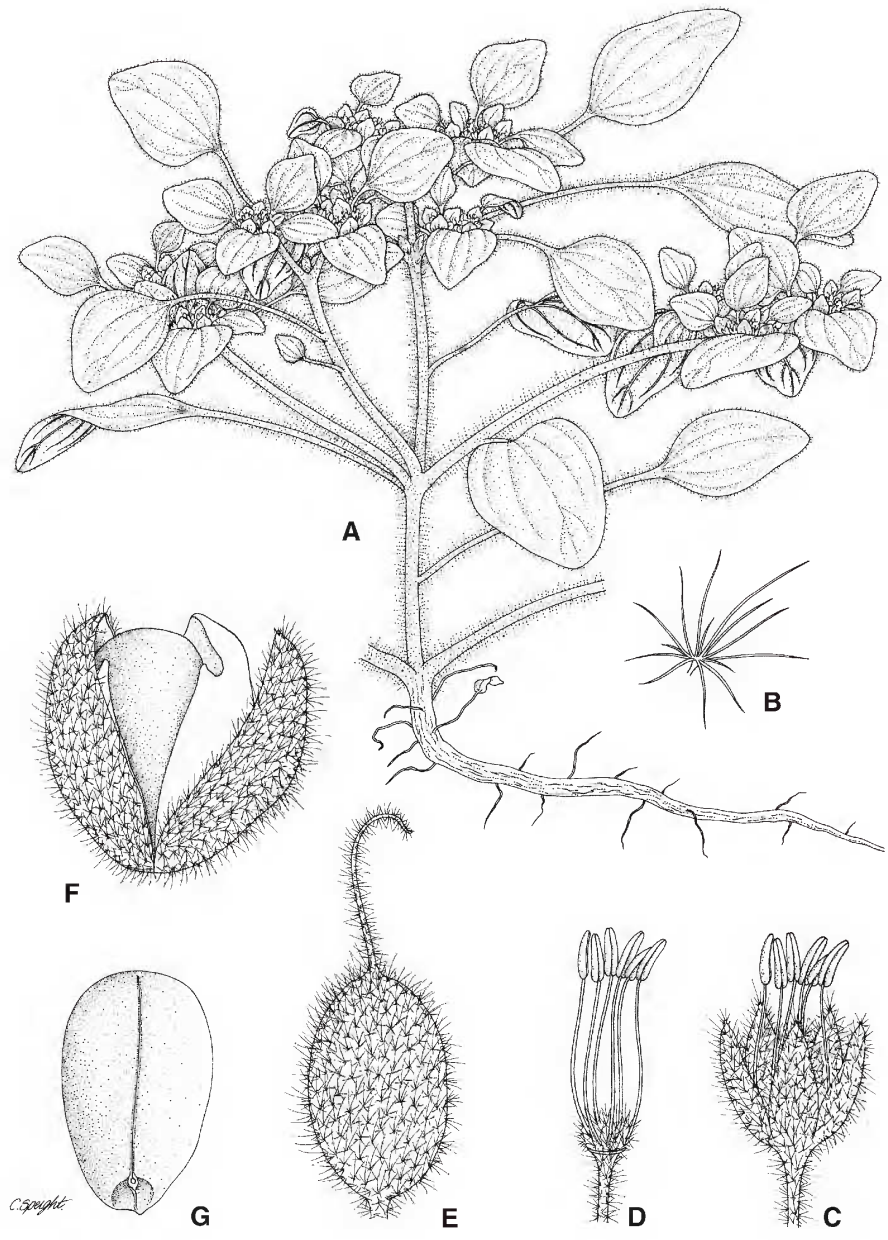


Fig. 24. ***Croton setigerus***. A. habit. × 1. B. stellate trichome. × 80. C. male flower. × 20. D. stamens. × 20. E. fruit. × 13.5. F. fruit, dehisced. × 13.5. G. seed. × 13.5. All from *Rose* 41457 (K). Del. C. Speight. Plate reproduced with permission from Radcliffe-Smith (2001: 325).

with dense stellate trichomes; bracts linear, 4–5 mm long, c. 0.1 mm wide, with dense stellate trichomes. Male flowers 3–4 mm long, 2.8–3.2 mm diameter, held singly, usually densely clustered towards top of inflorescence; pedicels 1.8–4 mm long, c. 0.1 mm wide, with sparse sessile trichomes; sepals valvate, 5, obovate, 2–2.5 mm long, 0.9–1 mm wide, with dense stellate trichomes; petals absent; stamens 5–7, filaments filiform, 2–3.8 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.8–1 mm long, 0.3–0.4 mm wide. Female flowers 6–7 mm long, c. 2 mm diameter, held singly and spaced up to 5 mm apart, sessile; sepals absent; petals absent; styles 1, linear-subulate, 3.5–5 mm long, entire, with sparse stellate trichomes; ovary 1-locular, c. 1.5 mm long and 0.2 mm diameter, with sparse stellate trichomes. Fruits unlobed, oblong, 4–6 mm long, 3–3.5 mm diameter, with dense, sessile stellate trichomes. Seeds ellipsoid, 3–5.2 mm long, 1.7–3 mm wide, 1.4–2.2 mm thick, cream and tan-brown mottled, ventral surface bifacial, dorsal surface rounded, micropylar ridge 2.5–4 mm long; ecarunculate. **Fig. 24**.

***Additional specimens*: United States of America. California.** Near Oroville, Butte County, Jul 1937, *Copeland* 1604 (BRI); Santa Cruz Island, Pelican Bay, Jul 1930, *Clokey* 4993 (BRI); Mandeville Canyon, Santa Monica Mountains, Los Angeles County, Aug 1929, *Clokey* 4599 & *Templeton* (BRI); Tenaja Ranger Station area, Rancho California, 7 miles NW of Murietta, southwest Riverside County, Oct 1971, *Grove* 8 (BRI); Saratoga summit, Santa Clara County, Sep 1941, *Rose* 41457 (BRI). **Australia. New South Wales.** Trangie district, Feb 1939, *Glenfield Vet. Research Station* (NSW); Trangie district, Feb 1942, *s.coll.* [AQ207216] (BRI); Trangie Expt. farm, Jan 1943, *May* s.n. (NSW); near Corowa, Apr 1965, *Mulham* s.n. (NSW); Shire of Corowa, Apr 1969, *Rodway* (MEL601784). **Victoria.** Granya, 36°07'S, 147°19'E, Apr 1984, *Roberts* (MEL662901).

***Distribution and habitat*:** *Croton setigerus* is native to California, U.S.A. and is naturalised in New South Wales and Victoria in agricultural areas where it is a weed of cultivated ground (**Map 9**). Jeanes (1999) mentioned that it was also naturalised in Western Australia and South Australia, but I have not seen specimens from those states.

***Notes*:** *Croton setigerus* has been usually placed in the monotypic genus *Eremocarpus,* most recently by Radcliffe-Smith (2001). Webster (1993a, 1994) has advocated the reduction of *Eremocarpus* to a monotypic section of *Croton* and this was followed by Radcliffe-Smith & Govaerts (1997), but at subgeneric level. *Croton setigerus* is very different from the species of *Croton* familiar to me from Australia and adjacent regions, primarily in the 1-locular female flower (thought to be an adaptation to wind pollination by Webster 1993a) and fruit and the ecarunculate seed. Webster's sectional classification requires a rigorous examination utilizing both morphological and molecular data, much beyond the scope of the current work, hence his reduction of *Eremocarpus* is followed here, although with reservations.

***Phenology*:** In Australia, flowering occurs from October to January, fruiting from January to April.

***Etymology*:** The specific name is derived from the Latin *seta* (bristle) and *-ger* (carrying or bearing) and probably alludes to the dense stellate indumentum of this plant.

25. Croton simulans P.I.Forst. **sp. nov.**, affinis *C. capitis-york* autem lamina foliorum venis lateralibus leniter (vice valde) effectis et squamis densis superpositus peltatis mixtis trichomatis stellatis remotis usque sparsis (vice non nisi squamis peltatis sparsis usque densis) subtus praeditis, nectariis extrafloralibus basi laminae foliorum dispositis et tantum subter videndis (vice mode infra basin laminae dispositis et videndis et supra et subter), floribus masculinis pedicellis longioribus (5–6 mm vice 1.4–1.6 mm) petalis longioribus (1.8–2 mm vice 1.4–1.5 mm) differt. **Typus:** Queensland. Cook District: Timber Reserve 14, Parish of Kesteven, 28 November 1991, *B. Hyland* 14377 (holo: QRS; iso: BRI).

Shrub to 5 m high, monoecious, deciduous, perennial. Indumentum silver. Branchlets rounded, with dense peltate scales and scattered stellate trichomes, glabrescents. Stipules minute, triangular, < 0.3 mm long and 0.3 mm wide, with scattered peltate scales. Leaves discolorous, petiolate; petioles 3–10 mm long, c. 1 mm wide, with dense peltate scales and stellate trichomes when young, glabrescent; lamina elliptic-ovate to oblanceolate, chartaceous, 10–150 mm long,

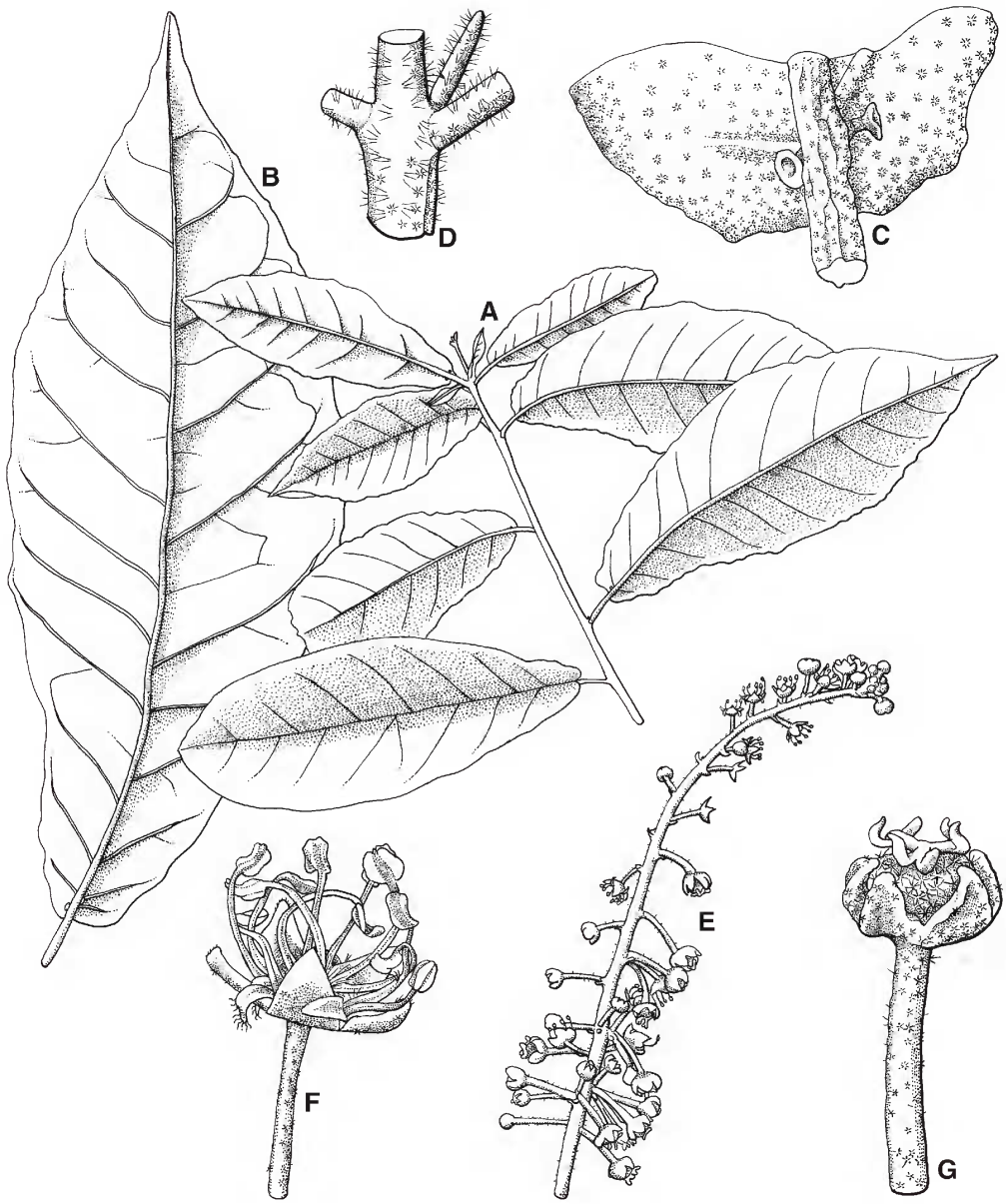


Fig. 25. ***Croton simulans.*** A. branchlet. × 0.5. B. undersurface of leaf. × 1. C. base of leaf lamina showing extrafloral nectaries. × 6. D. node showing stipule. × 6. E. inflorescence with female flowers towards base and male flowers in upper two-thirds. × 1. F. male flower. × 6. G. female flower. × 6. A–C from *Forster* PIF24072 (BRI); D–G from *Hyland* 25813 (BRI). Del. W. Smith.

4–60 mm wide, penninerved with 8–12 lateral veins per side of midrib, tertiary reticulate veins obscure; upper surface grey-green, lateral veins indistinct, with sparse to dense (overlapping) peltate scales, glabresent; lower surface silver to silver-green, lateral veins weakly developed, with sparse to dense (overlapping) peltate scales & scattered stellate trichomes, neither scabrid nor velutinous; margins entire or weakly sinuate, foliar glands prominent; tip obtuse, acute to short-acuminate; base cuneate to cordate; extrafloral nectaries 2, at leaf lamina base, sessile or stipitate to 1.2 mm long, ellipsoid, 0.3–0.4 mm long, 0.2–0.3 mm wide, visible only from below. Inflorescence up to 10 mm long, unbranched, unisexual or androgynous, pedunculate up to 10 mm; axis with dense peltate scales & stellate trichomes; bracts lanceolate, c. 1 mm long and 0.7 mm wide, with dense peltate scales. Male flowers c. 3 mm long, 4–5 mm diameter, clustered on inflorescence in glomerules of 1–3 flowers, or spaced to 5 mm apart; pedicels 5–6 mm long, c. 0.5 mm wide, with dense peltate scales & peltate trichomes; sepals valvate, 5, lanceolate-ovate, 1.8–2 mm long, 1–1.2 mm wide, lanate in upper half; petals 5, lanceolate-ovate, 1.8–2 mm long, 0.5–0.8 mm wide, lanate in upper half; stamens 10–12, filaments filiform, 2–2.2 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.8–1 mm long, 0.4–0.5 mm wide. Female flowers 2–2.5 mm long, 2.5–3 mm diameter, held singly and spaced up to 10 mm apart; pedicels 4–6 mm long, c. 1 mm diameter, with dense peltate scales and peltate trichomes; sepals valvate, 5, lanceolate-ovate, 1.8–2 mm long, 1.5–1.7 mm wide, with dense peltate scales; petals absent; styles 3, obloid, up to 1.2 mm long and 0.2 mm wide, bifid for up to 0.7 mm long, glabrous; ovary 3-locular, 1.8–2 mm long, 1.8–2 mm diameter, with dense ferruginous, stellate trichomes. Fruits and seeds not seen. **Fig. 25**.

***Additional specimens*: Queensland.** Cook District: T.R.14, Parish of Kesteven, Nov 1991, *Hyland* 25813 RFK (BRI, QRS). Cultivated: Station road, Ipswich by M.C.Tucker (ex plant collected on Leo Creek road, eastern fall of McIlwraith Range), Mar 1999, *Forster* PIF24072 (BRI).

***Distribution & habitat*:** *Croton simulans* is thus far known from only along the Leo Creek road in the western side of the McIlwraith Range on Cape York Peninsula (**Map 3**). Plants grow as understorey shrubs in araucarian microphyll vineforest on granite.

***Phenology*:** Flowers have been recorded in November. Fruit would be expected between January and February.

***Notes*:** *Croton simulans* is superficially similar to *C. capitis-york* and may well be a sister-taxon to that species but is immediately distinguishable in the field by the more silver appearance of the seasonally deciduous foliage. *Croton simulans* differs from *C. capitis-york* in the undersurface of the leaf lamina having weakly developed lateral veins (versus strongly developed), a mixture of dense (overlapping) peltate scales and scattered to sparse stellate trichomes (versus sparse to dense peltate scales only); the extrafloral nectaries situated at the base of the lamina and visible only from below (versus situated just below the lamina base and visible both from above and below); the male flowers with longer pedicels (5–6 mm versus 1.4–1.5 mm) and longer petals (1.8–2 mm versus 1.4–1.5 mm).

***Etymology*:** The specific epithet *simulans* (imitating or resembling) is formed directly from Latin and refers to the superficial similarity of this species to *Croton capitis-york*.

26. Croton stigmatosus F.Muell., Fragm. 4: 140 (1864); *C. phebalioides* var. *stigmatosus* (F.Muell.) Domin, Biblioth. Bot. 89: 880 (1928). **Type:** Queensland. Moreton District: Moreton Bay, 1845, *Leichhardt* [sheet with female specimen] (lecto [here chosen]: P *n.v.*, photo at BRI!).

Croton stigmatosus Muell.Arg., Linnaea 34: 107 (1865), *nom. illeg.*; *Oxydectes stigmatosus* (Muell.Arg.) Kuntze, Rev. Gen. Pl. 2: 613 (1891). **Type:** Queensland. Moreton District: Moreton Bay, 1845, *Leichhardt* [2 sheets seen, one is the lectotype sheet of *C. stigmatosus* F.Muell.] (syn: P *n.v.*, photo at BRI!); New South Wales. Clarence River, [*Beckler*] *F. Mueller* (syn: G-DC *n.v.*, fiche at BRI!; isosyn: P *n.v.*, photo at BRI!).

Croton phebalioides var. *hirsuta* F.M.Bail., Queensland Fl. 5: 1436 (1902). **Type:** Queensland. Moreton District: Taylor's Range, near Brisbane, *Bailey* (holo: *n.v.* at BRI, presumed lost).

***Illustrations*:** Floyd (1989: 143); James & Harden (1990: 420); Hauser (1992: 89).

Fig. 26. ***Croton stigmatosus*** A. fruiting branchlet. × 0.6. B. undersurface of leaf. × 1. C. base of leaf lamina showing extrafloral nectaries. × 8. D. node showing stipule. × 8. E. inflorescence with female and male flowers. × 3. F. male flower. × 8. G. female flower. × 6. H & I fruit. × 3. J. mamillate process with stellate hairs. × 20. K. seed. × 6. All from *Forster* PIF28042 (BRI). Del. W. Smith.

Shrub or small tree to 18 m high, monoecious, evergreen, perennial. Bark lenticellate, blaze flesh-yellow, wood cream-yellow. Indumentum silver. Branchlets ± rounded, with dense stellate trichomes when young, glabrescent. Stipules subulate, 1.5–7 mm long, c. 0.5 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 3–25 mm long, 1–1.2 mm wide, with dense peltate scales and stellate trichomes; lamina cuneate-obovate, elliptic or ovate, 13–160 mm long, 5–60 mm wide, penninerved with 12–15 lateral veins per side of midrib, tertiary reticulate veins obscure; upper surface matt dark-green, lateral veins weakly visible, with sparse stellate trichomes and sparse peltate scales; lower surface silver-white, lateral veins prominent, with dense stellate trichomes and dense peltate scales, neither scabrid nor velutinous; margins denticulate with 14–24 small teeth up to 0.5 mm long, foliar glands prominent; tip acute to acuminate; base cordate, cuneate, retuse; extrafloral nectaries 2 at base of leaf lamina, stipitate to 1.8 mm long, circular, 0.4–0.5 mm long, 0.4–0.5 mm wide, visible above and below. Inflorescence up to 180 mm long, unbranched, usually bisexual and androgynous but occasionally with male and female flowers mixed in same glomerules, pedunculate up to 32 mm; axis with dense stellate trichomes and dense peltate scales; bracts linear-lanceolate, 1.5–2 mm long, 0.3–0.5 mm wide, with dense stellate trichomes. Male flowers 2–3.5 mm long, 2.5–5 mm diameter, clustered towards top of inflorescence in glomerules of 2–7 flowers or held singly and spaced up to 8 mm apart; pedicels 2–4 mm long, 0.4–0.5 mm wide, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate, ovate or obovate, 1.5–2.2 mm long, 0.4–1.4 mm wide, with dense stellate trichomes; petals 5, obovate, 1.5–2.2 mm long, 0.3–0.8 mm wide, lanate in upper half; stamens 10–12, filaments ± filiform, 1.5–2 mm long, c. 0.1 mm wide, with dense simple trichomes at base, anthers oblong, 0.6–0.8 mm long, 0.5–0.7 mm wide. Female flowers 2.5–5 mm long, 3–8 mm diameter, usually held singly and spaced up to 7 mm apart; pedicels 5–8 mm long, c. 1 mm diameter, with dense stellate trichomes and dense peltate scales; sepals valvate, 5, obovate to ovate, 2.8–4 mm long, 1.5–3 mm wide, with dense stellate trichomes; petals absent; styles 3, linear, 1.5–3.5 mm long, multifid, twice divided for 1.3–3.2 mm long, connate at base for c. 0.2 mm, papillose and with sparse stellate trichomes on proximal two-thirds; ovary 3-locular, 2–3 mm long, 2.5–3.5 mm diameter, with dense, stalked stellate trichomes. Fruits trilobate, depressed-globose, 7–8 mm long, 7–10 mm diameter, with dense, stalked stellate trichomes on fleshy mamillate processes. Seeds ± ovoid, 5.5–6.5 mm long, 3.8–5 mm wide, 2.4–3.2 mm thick, black-brown, ventral surface bifacial, dorsal surface rounded, micropylar ridge 3.5–4 mm long; caruncle oblong-rectangular, 1–1.5 mm long, 1.3–2.5 mm wide, cream. **Fig. 26**.

***Selected additional specimens*: Queensland.** Port Curtis District: T.R. 353, W of Many Peaks, 24°32'S, 151°16'E, Nov 1995, *Bean* 9140 & *Turpin* (BRI); Shoalwater Bay, small island in archipelago in Pearl Bay, 22°25'S, 150°43'E, Jun 1999, *Brushe* JB2006 & *Plumb* (BRI); Pine Creek, S.F. 391 Bulburin, off lower reaches of Granite Creek, 24°37'S, 151°33'E, Dec 1994, *Forster* PIF16029 *et al.* (BRI); S.F. 67 Bulburin, May 1985, *Gibson* 734 (BRI, NSW). Wide Bay District: S.F. 234, SW of Cooroy, 26°29'S, 152°49'E, Apr 1993, *Bean* 5903 (BRI); Imbil, Mar 1918, *Weatherhead* [AQ202204] (BRI). Darling Downs District: Gully W of Swan Creek, 7.5 km NE of Swanfels & 11 km SW of Cunningham's Gap, 28°07'S, 152°19'E, Jan 1989, *Bird* [AQ455783] (BRI). Moreton District: Slopes of Mt Chingee, S of Rathdowney, 28°18'S, 152°26'E, Nov 2001, *Bean* 18015 (BRI, CANB, MEL, NSW); Rosen's Lookout, Beechmont, Mar 1977, *Elsol* [AQ194906] (BRI); CSR Land, Ormeau, 27°47'S, 153°13'E, Dec 2001, *Forster* PIF28042 & *Leiper* (A, BISH, BRI, DNA, L, MEL, MO, NSW, WIS, Z); Upper Brookfield, Brisbane, Feb 1978, *Jessup* 43 (BRI); Beechmont Ridge, Beechmont, Macpherson Range, Oct 1969, *Schodde* 5592 (BRI, CANB, MEL); Sunday Creek, Lamington N.P., *Smith* [AQ379568] (BRI); Blackall Range, Dec 1916, *White* [AQ202197] (BRI); Tamborine Mt, May 1940, *White* 11440 (BRI). **New South Wales.** Lismore, Mar 1898, *Baker* [MEL231575] (MEL); Wiangaree S.F., Jan 1981, *Bird* [AQ345018] (BRI); 23 km NW of Kyogle, Toonumbar forest road, Toonumbar S.F., 28°29'S, 152°48'E, Dec 1991, *Halford* Q824 (BRI, MEL, NSW); c. 2 miles [3.3 km] SW of Wiangaree, Oct 1966, *Hayes* 2558 *et al.* (BRI); Palm Gully forest road, Long Creek, between Roseberry & Queensland border, 28°23'S, 152°56'E, Apr 1981, *Jessup* 323 (BRI).

***Distribution and habitat*:** *Croton stigmatosus* is restricted to south-eastern Queensland from Shoalwater Bay in the north to the north-eastern corner of New South Wales (**Map 2**). It has been recorded from eleven 1° grid squares. Plants grow in complex notophyll vineforest that is often dominated by *Argyrodendron* spp. on volcanic soils.

Phenology: Flowering occurs from September to May; fruiting occurs from September to May.

Notes: F. Mueller (1864) cited four syntypes in the protologue for *Croton stigmatosus*, viz. "Ad flumen Richmond River, Dr Beckler; ad sinum Moreton Bay, Dr Leichhardt, F.M.; ad sinum Broad sound, Bowman; ad flumen Fitzroy River et montem Mueller Australiae orientalis tropicae, Dallachy". At P there are two sheets with specimens collected by Leichhardt from Moreton Bay, both apparently in 1845. One of these has buds, the other has female flowers. There are also sheets with collections apparently by F. Mueller (no locality) and Beckler 'Clarence River'. There is a Bowman collection from Broad Sound at MEL (MEL231578). This last collection does represent *Croton stigmatosus*, but the present day Broad Sound is well to the north of where the species is known to occur. I have been unable to locate the collections by Dallachy or Beckler (Richmond River). The name *Croton stigmatosus* F.Muell. is lectotypified with the Leichhardt collection at P that has female flowers.

To further complicate the nomenclature of this species, the name *Croton stigmatosus* was independently used by J. Mueller (1865) with the protologue stating "In Nova Hollandiae orientali ad Clarence River (F.Muell.! in hb.DC.), in Moreton-Bay (Leichhard! in hb.Mus.Paris)". The Leichhardt collection is the same one that I have used to lectotypify the name *C. stigmatosus* F.Muell. The Clarence River collection appears to have been made by Beckler and is present at both G-DC and P.

Croton stigmatosus is sometimes confused with large leaved forms of *C. phebalioides*. This latter species grows in drier closed-forest communities and differs most noticeably in the ± entire to weakly denticulate foliage with poorly developed lateral venation.

***Conservation status*:** *Croton stigmatosus* is infrequently collected but is not uncommon throughout its known range. It is present in at least three conservation reserves in south-eastern Queensland and two in New South Wales (Floyd 1989). No conservation coding is necessary.

***Etymology*:** The specific epithet is derived from the Latin *stigmatosus* and means having well developed stigmas.

27. Croton stockeri (Airy Shaw) Airy Shaw, Kew Bull. 35: 622 (1981); *Croton wassikussae* Croizat var. *stockeri* Airy Shaw, Muelleria 4: 229 (1980). **Type:** Queensland. Cook District: between Rocky River and Massy Creek, 13°40'S, 143°25'E, 13 September 1973, *G.C. Stocker* 1076 (holo: QRS; iso: BRI, CANB).

Shrub to 4m high, monoecious, evergreen or seasonally deciduous, perennial. Indumentum orange-brown. Branchlets rounded, with dense stellate trichomes. Stipules lanceolate, 3–6 mm long, 1–1.8 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 5–12 mm long, c. 1 mm wide, with dense stellate trichomes; lamina ovate to elliptic, 12–80 mm long, 10–50 mm wide, penninerved with 9–11 lateral veins per side of midrib, tertiary reticulate veins obscure; upper surface matt green, venation not visible, with sparse stellate trichomes; lower surface orange-brown, lateral veins weakly prominent, with dense, stellate trichomes, velutinous; margins sinuate to denticulate with 8–30 teeth up to 0.3 mm long, foliar glands prominent; tip acute to rounded; base cordate; extrafloral nectaries 2 at lamina base, sessile, ellipsoid, 0.5–0.9 mm long, 0.3–0.5 mm wide, visible only below. Inflorescence up to 80 mm long, unbranched, androgynous, pedunculate up to 5 mm; axis with dense stellate trichomes; bracts linear-lanceolate, 1.7–2 mm long, c. 0.4 mm wide, with dense stellate trichomes. Male flowers c. 2 mm long and 3 mm diameter, densely clustered in glomerules of 4–6 flowers towards the top of the inflorescence; pedicels c. 3.5 mm long and 0.2 mm wide, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate, c. 1.8 mm long and 1 mm wide, with dense stellate trichomes; petals 5, oblanceolate, 2–2.2 mm long, 0.4–0.5 mm wide, lanate in upper half; stamens 11–12, filaments filiform, 1.8–2.1 mm long, c. 0.2 mm wide, glabrous; anthers oblong, c. 0.8 mm long and 0.5 mm wide. Female flowers 4.5–5 mm long, 4.5–5 mm diameter, often mixed in same glomerule as males or held singly and spaced up to 5 mm apart; pedicels c. 3 mm long and 1 mm diameter, with dense stellate trichomes; sepals valvate, 5, lanceolate-ovate, c. 2.8 mm long and 1.5 mm wide, with dense stellate trichomes; petals absent; styles 3, linear, 2.5–3 mm long, bifid for 1–1.5 mm, glabrous, connate

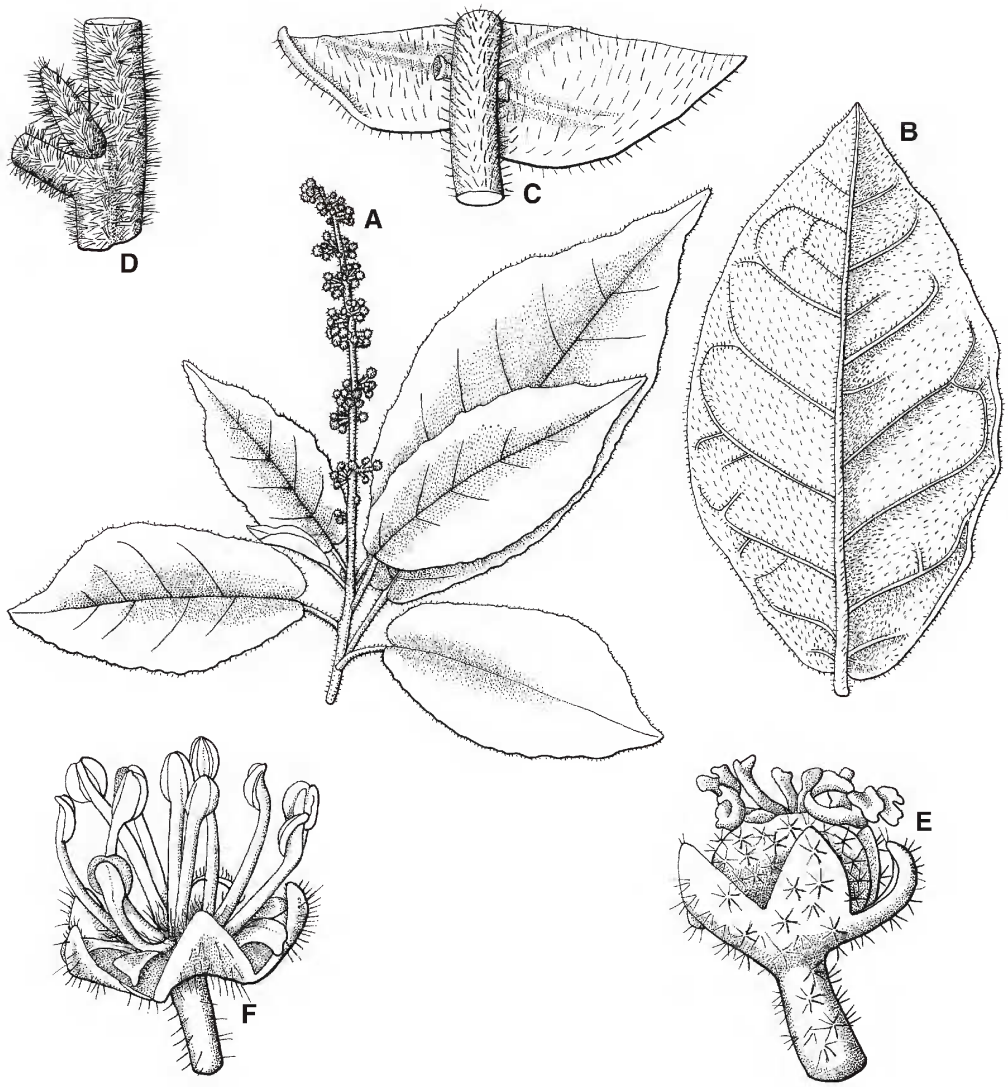


Fig. 27. ***Croton stockeri.*** A. budding branchlet. × 0.8. B. undersurface of leaf. × 1. C. base of leaf lamina showing extrafloral nectaries. × 4. D. node showing stipule. × 6. E. female flower. × 6. F. male flower. × 6. A & D from *Clarkson* 3631 (BRI); B,C,F from *Tucker* s.n. (BRI); E from *Stocker* 1076 (BRI). Del. W. Smith.

at base for c. 0.2 mm; ovary 3-locular, 3–3.8 mm long, c. 4 mm diameter, with dense stellate trichomes. Fruits and seed not seen. **Fig. 27**.

***Additional specimens*: Queensland.** Cook District: c. 10 km N of upper crossing of Massy Creek N of Silver Plains on eastern fall of McIlwraith Range, 13°51'S, 145°28'E, Aug 1978, *Clarkson* 2450 (BRI, CANB); 3 km N of Upper crossing of Massy Creek on Silver Plains Station, 13°53'S, 143°31'E, Nov 1980, *Clarkson* 3631 (BRI, QRS); Scrubby Creek, between the Rocky & the Chester River, Silver Plains Station, 13°46'S, 143°30'E, Dec 1990, *Fell* DGF2285 (QRS); 6 km W of the Rocky River mouth, Silver Plains Holding, 13°46'S, 143°29'E, Aug 1993, *Fell* DGF3484 *et al.* (BRI, DNA); 4 km NNE of Massy Creek Crossing, Silver Plains Station, 13°53'S, 143°30'E, Jun 1992, *Forster* PIF10567 *et al.* (BRI, DNA, MEL, QRS); 3 km N of Massy Creek Crossing, Silver Plains Station, 13°53'S, 143°31'E, Jun 1992, *Forster* PIF10580 *et al.* (A, BRI, DNA, K, L, MEL, QRS); Silver Plains, S of Scrubby Creek & W of Colmer Point, 13°46'S, 143°29'E, Jun 1995, *Forster* PIF17042 (BRI, MEL, QRS); Cultivated (ex Silver Plains Station, same site as *Forster* PIF17042), Jan 2002, *Tucker s.n.* (BRI).

***Distribution and habitat*:** *Croton stockeri* is endemic to Australia and is restricted to a single 1° grid square along with nine other species. All known populations occur on Silver Plains Station on the eastern fall of the McIlwraith Range on far northern Cape York Peninsula (**Map 3**). Plants grow in deciduous vinethicket on stabilised white sand dunes.

***Phenology*:** Flowers have been collected only once, in September. It may be presumed that the main flowering period is from September to January with fruiting two to three months later. Buds are retained on the plants for much of the remaining year.

***Notes*:** *Croton stockeri* is a distinctive *Croton* because of the heavily velutinous foliage covered in orange-brown stellate trichomes.

***Conservation status*:** The few known populations of *Croton stockeri* have no conservation security all being located on Aboriginal land. This species is currently listed as Rare under Queensland Government legislation.

***Etymology*:** The specific epithet honours Geoff Stocker, plant ecologist, who made the first collections of this plant while employed by the CSIRO.

28. Croton tomentellus F.Muell., Fragm. 4: 141 (1864). **Type:** Northern Territory. Upper Victoria River, on rocks, January 1856, *F. Mueller* [MEL231573] (holo: MEL).

Croton tomentellus Muell.Arg., Linnaea 34: 108 (1865), **nom. illeg.**; *Oxydectes tomentella* (Muell.Arg.) Kuntze, Rev. Gen. Pl. 2: 613 (1891). **Type:** Northern Territory. Arnhem's Land, *F. Mueller* (holo: G-DC *n.v.*, fiche at BRI).

***Illustrations*:** Wheeler (1992: 598, Fig. 182c); Dunlop *et al.* (1995: 214, Fig. 71).

Shrub to 4 high, monoecious, seasonally deciduous, perennial. Indumentum clear. Branchlets rounded, with sparse to dense stellate trichomes, glabrescent. Stipules lanceolate, 1.2–1.8 mm long, 0.3–0.5 mm wide, entire and with dense stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 12–55 mm long, 1–2 mm wide, with dense stellate trichomes; lamina ovate, 20–250 mm long, 15–110 mm wide, ± palminerved with 3–5 veins from the base, 10–14 lateral veins per side of midrib, and tertiary reticulate veins; upper surface matt green, venation not visible, with scattered to dense stellate trichomes; lower surface silver, lateral and tertiary venation weakly developed, with dense, velutinous stellate trichomes, often glabrescent, neither scabrid nor velutinous; margins denticulate or weakly crenate with 40–54 teeth up to 0.5 mm long, foliar glands prominent; tip acute to short acuminate; base cordate, cuneate or rounded; extrafloral nectaries 2 at lamina base, sessile, circular to ellipsoid, 0.4–0.7 mm long, 0.4–0.7 mm wide, visible on both surfaces. Inflorescence up to 130 mm long, unbranched, androgynous, pedunculate up to 20 mm; axis with sparse to dense stellate trichomes; bracts lanceolate, 1–2 mm long, 0.3–0.5 mm wide, with sparse to dense stellate trichomes. Male flowers 2–4.5 mm long, 3.5–5 mm diameter, densely clustered in glomerules of 1–5 flowers towards the top of the inflorescence; pedicels 2–5.2 mm long and c. 0.5 mm wide, with sparse to dense stellate trichomes; sepals valvate, 5, lanceolate-ovate, 2–2.3 mm long, 0.8–1.8 mm wide, with sparse stellate trichomes; petals 5, oblanceolate, 3–3.2 mm long, 0.7–1 mm wide, lanate in upper half; stamens 11 or 12, filaments filiform, 2–2.5 mm long, c. 0.2 mm wide, glabrous, anthers oblong,

Fig. 28. ***Croton tomentellus***. A. flowering branchlet. × 0.4. B. node showing stipule. × 6. C. base of leaf lamina showing extrafloral nectaries. × 6. D. inflorescence with female flowers towards base, male flowers in upper two-thirds, some glomerules with both sexes. × 1. E. male flower. × 8. F. female flower. × 8. G & H. fruit × 4. I. seed. × 8. A,D,E,F from *Brock* 739 (BRI); B,C,I from *Byrnes* 1204 (BRI); G,H from *Brock* 656 (BRI). Del. W. Smith.

0.7–1 mm long, 0.6–0.7 mm wide. Female flowers 2.5–3 mm long, 3–4 mm diameter, often mixed in same glomerule as males or held singly and spaced up to 5 mm apart; pedicels 1.2–2.2 mm long, c. 0.8 mm diameter, with sparse stellate trichomes; sepals valvate, 5, lanceolate-ovate, 1.8–2.3 mm long, 1–1.8 mm wide, with sparse stellate trichomes; petals absent; styles 3, linear, 2–2.7 mm long, bifid for 1.2–1.4 mm, glabrous; ovary 3-locular, 1.5–2.2 mm long 1.5–2.2 mm diameter, with dense, ± sessile stellate trichomes. Fruits trilobate, globose, 4.5–6 mm long, 5–5.5 mm diameter, with sparse, ± sessile stellate trichomes. Seed ± ovoid, 3.5–4.4 mm long, 3–3.3 mm wide, 2.3–2.8 mm thick, dorsal surface rounded, ventral surface bifacial, micropylar line 2–2.8 mm long; caruncle ovate, c. 0.7 mm long and 0.7 mm wide, cream. **Fig. 28**.

***Selected additional specimens*: Western Australia.** Upper Neville Creek in Harding Range, Eastern Walcott inlet, 16°17'S, 124°59'E, May 1983, *Fell* DGF32 (BRI, PERTH); Savlon Gorge, 16°30'S, 125°16'E, Feb 1989, *Hyland* 13842 (QRS); Mitchell Plateau, 14°33'S, 125°48'E, Dec 1982, *Kenneally* 8636 (CANB, PERTH); S of Ninbing Homestead site, N of Kununurra, Jun 1969, *Lullfitz* 691102–21 & *McKenzie* (PERTH); c. 15 km W of Kalumburu on road to Truscott on Lip of Poompangala Hill, 14°17'S, 126°34'E, Dec 1992, *Mitchell* 2812 (BRI); Walsh Point - Point Warrender, 14°34'S, 125°45'E, May 1981, *Tracey* 13955 (BRI); Lone Dingo between Mitchell Plateau Mining Camp & Point Warrender, 14°35'S, 125°43'E, May 1981, *Tracey* 13956 (BRI). **Northern Territory.** Timber Creek, 15°40'S, 130°30'E, Mar 1989, *Brock* 656 (BRI, DNA); Mt Bundy, 12°52'S, 131°36'E, Nov 1990, *Brock* 739 & *Russell-Smith* (BRI, DNA, CANB, MEL, QRS); Bullita Station, Gregory N.P., 16°03'S, 130°23'E, Feb 1986, *Clark* 292 & *Wightman* (DNA); c. 67 miles [111.7 km] NE of Maranboy Police Station, Mar 1965, *Lazarides & Adams* 98 (CANB, MEL); Mt Goyder, 12°52'S, 131°41'E, May 1987, *Russell-Smith* 2358 & *Lucas* (DNA); 4 km W Umbakumba, Groote Eylandt, 13°52'S, 136°47'E, Jul 1987, *Russell-Smith* 2740 & *Lucas* (DNA); Groote Eylandt, 8 km SW Umbakumba, 13°55'S, 136°43'E, Jul 1987, *Russell-Smith* 2764 & *Lucas* (DNA); Groote Eylandt, 6 km S Umbakumba, 13°54'S, 136°49'E, Jul 1987, *Russell-Smith* 2814 & *Lucas* (DNA); Cutta Cutta, Guy Cave, 14°35'S, 132°27'E, Dec 1988, *Russell-Smith* 6506 & *Lucas* (BRI, DNA); 4 km SE Mt Harris, Kakadu, 13°18'S, 131°57'E, Jan 1989, *Russell-Smith* 6605 & *Lucas* (DNA); 20 km S Jasper Gorge, 16°13'S, 130°43'E, Mar 1989, *Russell-Smith* 7715 (DNA); Headwaters of Big Horse Creek, 15°43'S, 130°25'E, Mar 1989, *Russell-Smith* 7779 (BRI, DNA); Guy Cave area, 16 Mile Cave Reserve S of Katherine, May 1978, *Tracey* 14049 (BRI); Malgala, Groote Eylandt, 13°52'S, 132°26'E, Nov 1976, *Waddy* 617 (DNA).

***Distribution and habitat*:** *Croton tomentellus* is endemic to northern Australia where it occurs in a number of disjunct populations in the Northern Territory and Western Australia over a total of fourteen 1° grid squares (**Map 9**). Plants grow in deciduous vinethicket on granite, laterised basalt or sandstone substrates. There is also one record from open woodland on basalt.

***Phenology*:** Flowering occurs from November to March following storm rains; fruiting occurs from November to April.

***Notes*:** This species was included by Webster (1993a) in *Croton* section *Croton*, but does not have the characters given for that section, e.g. 11 or 12 stamens (versus 15–35).

***Conservation status*:** *Croton tomentellus* is widespread and present in Kakadu and Gregory National Parks. It is not considered rare or threatened.

***Etymology*:** The specific epithet is derived from the Latin *tomentellus* and means minutely tomentose, perhaps alluding to the indumentum on the lower leaf surface or the fruit.

29. Croton triacros F.Muell., Fragm. 6: 185 (1868). **Type:** Queensland. North Kennedy District: Rockingham's Bay, *Dallachy* (lecto [here chosen]: MEL231564).

Shrub to 5 m high, monoecious, evergreen, perennial. Indumentum ferruginous. Branchlets rounded, with scattered peltate trichomes when young, glabrescent. Stipules lanceolate, 4–4.5 mm long, c. 0.5 mm wide, entire and with scattered to sparse peltate trichomes. Leaves alternate, discolorous, petiolate; petioles 3–36 mm long, c. 1 mm wide, with sparse peltate trichomes; lamina elliptic, broadly elliptic or oblanceolate, 75–185 mm long, 40–70 mm wide, penninerved with 9–11 lateral veins per side of midrib and tertiary reticulate veins; upper surface dark green, venation weakly visible, with scattered peltate trichomes when young; lower surface pale green, lateral and tertiary venation weakly prominent, glabrous apart from a few scattered peltate trichomes, neither scabrid nor velutinous; margins sinuate or very weakly denticulate with 20–30 teeth up to 0.3 mm long, foliar glands prominent; tip acute to short acuminate; base cuneate; extrafloral nectaries 2 at lamina base sessile, ellipsoid, 0.7–1.3 mm

Fig. 29. ***Croton triacros***. A. fruiting branchlet. × 0.4. B. base of leaf lamina showing extrafloral nectaries. × 8. C. node showing stipules. × 8. D. inflorescence with female flowers in lower half and male flowers in upper half. × 2. E. female flower. × 12. F. male flower. × 8. G & H. fruits. × 4. I. seed. × 8. A–E from *Jago* 3060 (BRI); F from *Forster* PIF18189 (BRI); G–I from *Forster* PIF13081 (BRI). Del. W. Smith.

long, 0.4–0.7 mm wide, visible below only. Inflorescence up to 110 mm long, unbranched, androgynous, pedunculate up to 10 mm; axis glabrous or with a few scattered peltate trichomes; bracts lanceolate, 0.5–1 mm long, 0.2–0.3 mm wide, glabrous. Male flowers 2–2.5 mm long, 2–3.5 mm diameter, held singly or in 2–4-flowered glomerules up to 4 mm apart towards the top of the inflorescence; pedicels 1.8–4 mm long and c. 0.2 mm wide, glabrous; sepals valvate, 5, lanceolate-ovate, 1.6–2 mm long, 0.9–1.2 mm wide, glabrous, lanate in upper half; petals 5, oblanceolate, 1.8–2 mm long, 0.6–0.8 mm wide, lanate; stamens 10–11, filaments filiform, 1–2 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.4–0.6 mm long, c. 0.3 mm wide. Female flowers c. 2 mm long and 2 mm diameter, often mixed in pairs in same glomerule as males or held singly and spaced up to 13 mm apart; pedicels 1.5–3 mm long, 0.5–0.6 mm diameter, with scattered peltate trichomes; sepals valvate, 5, lanceolate, 1.4–2.3 mm long, 0.8–1.3 mm wide, glabrous, or with scattered peltate trichomes; petals absent; styles 3, linear, 1.8–2.2 mm long, bifid for 0.7–1 mm, shortly connate at base, glabrous; ovary 3-locular, 1.2–2 mm long, 1.2–2 mm diameter, with sparse, ± sessile peltate trichomes. Fruits trilobate, globose, 4.5–7 mm long, 5–7 mm diameter, with scattered, ± sessile peltate trichomes. Seed ± ovoid to obloid, 3–5 mm long, 2.3–4 mm wide, 1.8–3.5 mm thick, dorsal surface rounded, ventral surface bifacial, micropylar line 2.5–3.5 mm long; caruncle ± crescent shaped, 0.5–0.8 mm long, 0.7–1.2 mm wide, cream. **Fig. 29**.

***Selected additional specimens*: Queensland.** Cook District: c. 15 miles [25 km] NNW of Daintree, 16°04'S, 145°14'E, Nov 1967, *Boyland* 466 & *Gillieatt* (BRI, CANB); T.R. 14, McIlwraith Range, head of Peach Creek, 13°44'S, 143°20'E, Dec 1990, *Fell* DGF2279 (QRS); 36.5 km along road to Leo Creek Mine, McIlwraith Range, 13°44'S, 143°20'E, Jun 1992, *Forster* PIF10299 & *Tucker* (BRI, QRS); T.R. 14, Leo Creek Mine area, McIlwraith Range, 13°44'S, 143°22'E, Jun 1992, *Forster* PIF10116 *et al.* (BRI, QRS); S.F. 185 Danbulla, 7 km SW of Hoop Pine Triangle, 17°09'S, 145°35'E, Jan 1993, *Forster* PIF13081 & *Bean* (BRI, MEL, NSW); Pinnacle Track, 2 km W of Karnak, 16°23'S, 145°18'E, Jul 1994, *Forster* PIF15529 *et al.* (BRI, QRS); Tully Falls Weir road, 17°46'S, 145°33'E, Nov 1995, *Forster* PIF18199 & *Spokes* (BRI, MEL, QRS); S.F. 185 Danbulla, Tinaroo Dam, 17°09'S, 145°33'E, Jan 2002, *Forster* PIF28160 *et al.* (A, BRI, L, MEL, NY, WIS); T.R. 9, Lankelly Creek, 13°55'S, 143°20'E, Sep 1971, *Hyland* 5382 (BRI, QRS); Mt Carter, 13°00'S, 143°15'E, Sep 1974, *Hyland* 7532 (BRI, QRS); T.R. 14 Kesteven, 13°43'S, 143°20'E, Oct 1981, *Hyland* 11138 (QRS); Harvey Creek, 10 km N of Babinda, 17°50'S, 145°54'E, Jan 1994, *Jago* 3060 (BRI); Harvey's Creek, Russell River, 1887, *Sayer* s.n. (MEL); c. 12.8 km SW of Atherton on ranges near Moomin, Sep 1950, *Smith* 4663 (BRI); Baileys Creek area, on bank of Hutchinson Creek, Oct 1962, *Smith* 11586 (BRI); McDowall Range, 16°06'S, 145°17'E, Oct 1973, *Tracey* 14540 (BRI); Lankelly Creek on western fall of McIlwraith Range, 13°55'S, 143°15'E, Oct 1969, *Webb & Tracey* 9625 (BRI); Spear Creek, Mt Danbulla, 16°43'S, 145°24'E, Oct 1973, *Webb & Tracey* 12027 (BRI). North Kennedy District: S.F. 268 Mt Spec, 3 km along Ewan road past Paluma Dam turnoff, 19°01'S, 146°08'E, Jan 1992, *Forster* PIF9493 (BRI, DNA, K, L, MEL, QRS); Mt Spec near Bambaroo, Nov 1933, *Francis* [AQ202219] (BRI).

***Distribution and habitat*:** *Croton triacros* is endemic to north-eastern Queensland where it is disjunct with most populations in the "Wet Tropics", and a northern population in the Leo Creek area of the McIlwraith Range (**Map 7**). The species occurs in six 1° grid squares. Plants grow in araucarian or complex notophyll vineforests, usually on granite substrates.

***Phenology*:** Flowering occurs from October to April following storms or seasonal rains, fruiting occurs from October to May.

***Notes*:** There are two sheets at MEL (MEL231567 and MEL231564) that are suitable as a lectotype of *Croton triacros*. Both are undated and the labels state that the material originates from Rockingham's Bay and was collected by Dallachy. The first of these is male flowering material and the latter has female flowers and fruit. It is unclear whether the two sheets were collected at the same time, hence the better sheet (MEL231564) is selected as lectotype of the name *C. triacros*.

***Conservation status*:** Common and present in conservation reserves at Crystal Creek and Daintree National Parks.

***Etymology*:** Obscure.

30. Croton verreauxii ('verreauxia') Baill., Et. Gen. Euphorb. 357 (1858); *Oxydectes verrauxii* (Baill.) Kuntze, Rev. Gen. Pl. 2: 613 (1891). **Type:** New South Wales. Camp in Heaven, *Verreaux* 59 (holo: P *n.v.*, photo at BRI).

Croton verreauxii var. *genuinus* Muell.Arg., Linnaea 34: 47 (1865), nom. inval. **Type:** as for *C. verreauxii* Baill.

Croton verreauxii var. *longifolius* Muell.Arg., Linnaea 34: 47 (1865). **Type:** New South Wales. Clarence River, *Beckler* (holo: B *n.v.*).

***Illustrations*:** Williams (1987: 83); Floyd (1989: 144); James & Harden (1990: 418); Hauser (1992: 181).

Shrub to 5 m high, monoecious, evergreen, perennial. Indumentum silver. Branchlets ± rounded, with scattered to sparse peltate scales when young, glabrescent. Stipules linear-lanceolate, 1.5–2 mm long, c. 0.6 mm wide, entire and with sparse peltate scales. Leaves alternate, discolorous, petiolate; petioles 1–36 mm long, 0.8–1 mm wide, with scattered peltate scales when young, glabrescent; lamina elliptic to lanceolate, 15–120 mm long, 5–40 mm wide, penninerved with 12–13 lateral veins per side of midrib, tertiary reticulate veins obscure to poorly developed; upper surface glossy dark green, venation obscure, glabrous; lower surface pale green, lateral veins poorly developed, with scattered peltate scales, neither scabrid nor velutinous; margins denticulate to weakly crenate with 11–24 teeth up to 0.5 mm long, foliar glands prominent; tip acute to acuminate; base cuneate; extrafloral nectaries 2 at lamina base, stipitate up to 0.3 mm long, circular to ellipsoid, 0.3–0.6 mm long, 0.2–0.4 mm wide, visible from above and below. Inflorescence up to 170 mm long, androgynous, pedunculate up to 10 mm; axis glabrous or with scattered peltate scales; bracts lanceolate to triangular, 0.6–1 mm long, 0.2–0.3 mm wide, glabrous or with a few scattered peltate scales near top. Male flowers 2–2.6 mm long, 1.5–2.2 mm diameter, in clusters of 2 or 3 flowers per glomerule, spaced up to 5 mm apart; pedicels 2–3.5 mm long, c. 0.2 mm wide, glabrous; sepals valvate, 5, lanceolate-ovate, 1–1.8 mm long, 0.5–0.9 mm wide, lanate; petals 5, oblanceolate, 1–1.8 mm long, 0.4–0.6 mm wide, lanate; stamens 10–12, filaments filiform, 0.6–1 mm long, c. 0.1 mm wide, glabrous, anthers oblong, 0.3–0.6 mm long, 0.3–0.6 mm wide. Female flowers c. 2 mm long, 2.5–3 mm diameter, held singly and spaced up to 7 mm apart; pedicels 1–2 mm long, 0.5–0.7 mm diameter, with scattered peltate scales; sepals valvate, 5, lanceolate, 1–1.8 mm long, 0.4–0.8 mm wide, glabrous or lanate at tip; petals absent; styles 3, linear, 2–2.8 mm long, bifid for 1–1.8 mm long, connate at base for c. 0.1 mm, glabrous; ovary 3-locular, 1.4–1.8 mm long, 1.5–1.8 mm diameter, with dense, sessile, yellow peltate scales. Fruits trilobate, depressed-globose, 4–6 mm long, 5–6.5 mm diameter, with sparse, sessile, yellow peltate scales. Seeds ± ovoid, 4–4.5 mm long, 2.9–3.5 mm wide, 2.2–3 mm thick, brown with slight cream mottling, ventral surface ± rounded, dorsal surface rounded, micropylar ridge 3–4 mm long; caruncle crescent shaped, 0.5–0.8 mm long, 1–1.3 mm wide, cream. **Fig. 30**.

***Selected additional specimens*: Queensland.** Wide Bay District: S.F. 234, SW of Cooroy, 26°28'S, 152°49'E, Dec 1993, *Bean* 7144 (BRI, MEL, MO); Imbil, S.F. 135, Brooloo, Western L.A., 26°30'S, 152°39'E, Oct 1982, *McDonald* 3749 & *Williams* (BRI, NSW). Darling Downs District: The Head, NE of Killarney, Dec 1984, *Bird* [AQ396387] (BRI); The Head, Main Range N.P., 28°14'S, 152°57'E, Jan 2001, *Forster* PIF28064 & *Leiper* (A, BRI, K, MEL, WIS). Moreton District: Petrie Creek, W of Woombye, 26°40'S, 152°55'E, Nov 1989, *Bean* 1188 (BRI); Upper end of Duck Creek road, near O'Reilly's, Lamington Plateau, 28°12'S, 153°07'E, May 2000, *Forster* PIF25612 & *Booth* (A, BRI, L, MEL); The Ranch, foot of Wilson's Peak, Nov 1935, *Michael* 2241 (BRI); Sarabah Range, c. 10 miles [16.7 km] S of Canungra, Oct 1969, *Schodde* 5584 (BRI, CANB); Beechmont Ridge, Beechmont, McPherson Range, Oct 1969, *Schodde* 5591 (BRI, CANB); Peecheys Scrub, Dec 1887, *Simmonds* [AQ202226](BRI); Tamborine Mt, Jan 1916, *White* [AQ202220] (BRI); Lamington N.P., Dec 1937, *White* 11401 (BRI). **New South Wales.** c. 10 miles [16.7 km] WSW of Dungog on the road to Gresford, Nov 1970, *Blaxell* 3357 & *Coveny* (BRI); Wyong, Nov 1916, *Boorman* [AQ202242](BRI); Border Fence, Moss Gardens, 28°17'S, 152°27'E, Jan 1990, *Forster* PIF6215 *et al.* (BRI, QRS); 23 km NW of Kyogle, Toonumbar Forest road, Toonumbar S.F., 28°29'S, 152°48'E, Dec 1991, *Halford* Q821 (BRI, MEL); Edinburgh Castle, 8 km SSE of Woodenbong, 28°27'S, 152°38'E, Dec 1992, *Halford* Q1561 (BRI); Minyon Falls, Whian Whian, Sep 1966, *Jones* [AQ202248] (BRI); Yaamba, Oct 1947, *King* [AQ202247] (BRI); 22 miles [36.7 km] NE of Singleton, Mar 1960, *Story* 7163 (BRI, QRS); Upper Williams River near Salisbury, Mar 1938, *White* 11608 (BRI). **Victoria**. Cult. at "Dunedin", Tyers from a cutting from... Back Creek N of Noorinbee, Apr 1979, *Galbraith* [MEL1527573] (MEL).

***Distribution and habitat*:** *Croton verreauxii* is endemic to eastern Australia where it occurs from south-eastern Queensland through eastern New South Wales south to Illawarra (Floyd 1989) over a total of fifteen 1° grid squares (**Map 7**). A doubtful locality record in north-eastern Victoria (cited above) has been discounted by Jeanes (1999) who stated that attempts to relocate the plant in the field have been unsuccessful. Plants grow in complex notophyll vineforest and microphyll moss/fern

Fig. 30. ***Croton verreauxii***. A. flowering branchlet. × 0.5. B. base of leaf lamina showing extrafloral nectaries. × 8. C. node showing stipule. × 8. D. inflorescence with female flowers in lower half and male flowers in upper half. × 1. E. male flower. × 8. F. female flower. × 8. G & H. fruit. × 4. I. seed. × 8. All from *Forster* PIF25612 (BRI). Del. W.Smith.

thickets on volcanic soils, or may be found in the ecotonal areas between closed-forest and open forest dominated by eucalypts.

***Phenology*:** Flowering occurs from August to March and fruiting occurs from October to April.

***Notes*:** The spelling of the epithet for this species was originally given as 'verreauxia', but as the species was named after Verreaux, the spelling should be 'verreauxii'.

Croton verreauxii was included in *Croton* section *Tiglium* by Webster (1993a) but does not agree with character states for this section, e.g. peltate scales (versus stellate trichomes).

Govaerts *et al.* (2000) have recently erroneously labelled an old illustration from Seeman (1867) as *C. verreauxii* based on Fijian material. As noted by Smith (1981), this is referable to the Fijian endemic *C. microtiglium.*

***Conservation status*:** Common. Present in at least three conservation reserves in Queensland (Forster *et al.* 1991) including Lamington and Main Range National Parks. Recorded from nine conservation reserves in New South Wales (Floyd 1989).

***Etymology*:** The specific epithet honours J.P.Verreaux (1807–1873), a French man resident in Tasmania and one-time botanical collector.

31. Croton waterhouseae P.I.Forst., **sp. nov.** affinis *C. multicauli* autem dentibus marginis foliorum pluribus (32–40 vice 16–28), pedicellis florium masculinorum multo longioribus (10–12 mm vice 1.5–7 mm), staminibus in floribus masculinis pluribus (32–38 vice 11–24) differt. **Typus**: Queensland. Cook District: Gabba Island, Torres Strait, 13 January 1998, *B.M.Waterhouse* BMW4775 & *J.Grimshaw* (holo: BRI).

Shrub to 4 m high, monoecious, evergreen (?), perennial. Indumentum silver to silver-ferruginous. Branchlets ± rounded, with sparse to dense sessile and shortly stalked stellate trichomes, glabrescent. Stipules linear, 4–6 mm long, c. 0.8 mm wide, with dense sessile and shortly stalked stellate trichomes. Leaves alternate, discolorous, petiolate; petioles 5–25 mm long, 1–1.2 mm wide, with dense sessile and shortly stalked stellate trichomes; lamina elliptic to obovate, 35–90 mm long, 20–50 mm wide, palminerved with 2 nerves from base per side of midrib and 4 lateral nerves per side of midrib, and distinct tertiary reticulate veins; upper surface dark green, venation weakly visible, with sparse, sessile stellate trichomes mainly on veins; lower surface grey-silver, lateral and interlateral veins prominent, with dense sessile and stalked stellate trichomes, velutinous; margins weakly crenate, with 32–38 teeth to 2 mm long, foliar glands scattered and prominent; tip acute; base cuneate to truncate; extrafloral nectaries 2(3) at base of lamina, shortly stipitate to 1 mm long, ellipsoid, 1.4–1.8 mm long, 1–1.2 mm wide, visible above and below. Inflorescence up to 110 mm long, androgynous, pedunculate up to 25 mm long, axis with sparse to dense sessile and stalked stellate trichomes; bracts linear-lanceolate, 0.8–1 mm long, 0.4–0.5 mm wide, with dense sessile stellate trichomes. Male flowers 4–5 mm long, 6–7 mm diameter, in sparse glomerules of 1 or 2 flowers in upper 4/5 of inflorescence; pedicels 10–12 mm long, c. 0.3 mm diameter, with dense sessile and stalked stellate trichomes; sepals valvate, 5, lanceolate-ovate, 2–2.3 mm long, c. 0.8 mm wide, with lanate tip and with dense sessile to stalked stellate trichomes; petals 5, obovate, 2–2.2 mm long and c. 0.5 mm wide, lanate around entire edge; stamens 32–38; filaments filiform, 2.5–3.5 mm long and c. 0.2 mm wide, with dense, simple trichomes at base; anthers oblong, 0.8–1 mm long and c. 0.5 mm wide. Female flowers 2.8–3 mm long, c. 4 mm wide, held singly and spaced up to 11 mm apart; pedicels 4.5–5 mm long, 0.8–1 mm wide, with dense sessile stellate trichomes; sepals valvate, 5, lanceolate-ovate, c. 2 mm long and 1.5 mm wide, with dense sessile stellate trichomes; petals absent; styles 3, linear-flabellate, c. 2.5 mm long, bifid for c. 2 mm, with scattered sessile stellate trichomes in lower third; ovary 3-locular, c. 3 mm long and 2 mm wide, with dense sessile stellate trichomes. Fruits and seeds not seen. **Fig. 31**.

***Distribution & habitat*:** *Croton waterhouseae* is known only from the type locality at present. Gabba Island is a continental granitic island (**Map 7**). No information about the habitat was available.

***Phenology*:** The species probably flowers from December through to February, with fruits several months later. The only known specimen is flowering and collected in January.

Fig. 31. ***Croton waterhouseae.*** A. habit of flowering branchlet. × 0.6. B. undersurface of leaf. × 1. C. base of leaf lamina showing extrafloral nectaries. × 6. D. node showing stipule. × 6. E. inflorescence with all male flowers. × 1.5. F. male flower. × 6. G. female flower. × 6. All from *Waterhouse* 4775 (BRI). Del. W. Smith.

***Notes*:** *Croton waterhouseae* is closely allied to the complex of species centred around *C. arnhemicus*. It is perhaps most closely related to *Croton multicaulis*, but differs from that species in the greater number of leaf margin teeth (32–40 per leaf, versus 16–28), the much longer male flower pedicels (10–12 mm versus 1.5–7 mm) and the greater number of stamens in the male flowers (32–38 versus 11–24). *Croton arnhemicus* is immediately distinguishable in the much greater number of leaf margin teeth (60–100 versus 32–40) and the generally scabrous foliage (versus softly velutinous). From both of these species it would also appear that *Croton waterhouseae* may differ (more specimens are required to be sure) in the disposition of the veins that emanate from the base of the lamina and that are immediately adjacent to the midrib. In *Croton waterhouseae* these veins steeply ascend beside the midrib at an angle of no more than 30° terminating well over half way along the leaf lamina. In both *Croton arnhemicus* and *C. multicaulis*, as well as the related *C. aridus* and *C. minimus*, these same veins strongly diverge way from the midrib at an angle of more than 45° and usually terminate no more than half way along the leaf lamina.

***Conservation status*:** Unknown at this stage. Gabba Island is uninhabitated.

***Etymology*:** Named for Barbara Waterhouse, NAQS botanist with the Australian Quarantine Inspection Service, and collector of several thousand specimens for the Queensland Herbarium from northern Australia and adjacent Malesia.

Excluded names and species

1. **Croton argyratus** Blume, Bijdr. 602 (1826).

***Notes*:** This name was misapplied to the Australian endemic *Croton schultzii* (see notes there).

2. **Croton opponens** F.Muell. ex Benth., Fl. Austral. 6: 125 (1873).

***Notes*:** Base name for *Bertya opponens* (F. Muell. ex Benth.) Guymer (Guymer 1985; Halford & Henderson 2002).

3. **Croton phebalioides** var. **hispida** J.Simmonds, *Proc. Roy. Soc. Queensland* 6: 68 (1889). ***nom. nud.*** **Type:** not designated.

***Notes*:** There is no diagnosis or type for this name.

4. **Croton prunifolius** Airy Shaw, ***nom. illeg.*** *non* Geiseler (1807), Kew Bull. 33: 56 (1978); **Croton coccymelophyllus** Radcl.-Sm. & Govaerts, Kew Bull. 52: 186 (1997).

***Notes*:** The name *Croton prunifolius* was misapplied by Airy Shaw (1981) to a sterile collection of *C. habrophyllus* from Western Australia. Because the name *Croton prunifolius* Airy Shaw was illegimate, Radcliffe-Smith & Govaerts (1997) consequently renamed this species as *Croton coccymelophyllus* Radcl.-Sm. & Govaerts. As a result this species was also recorded with a ? from N. Western Australia in Govaerts *et al.* (2000), a splendid example of misinformation and error perpetuation. *Croton coccymelophyllus* appears to be distributed in parts of Malesia, such as the Lessa Sunda Islands, Maluku and New Guinea.

5. **Croton quadripartitus** Labill. (as 'quadripartitum'), Nov. Holl. Pl. Sp. 2: 73 (1806).

***Notes*:** Base name for *Adriana quadripartita* (Labill.) Muell.Arg. (Airy Shaw 1980: 593).

6. **Croton rosmarinifolius** A.Cunn. (as 'rosmarinifolium') in Field, Geographical Mem. New South Wales 355 (1825).

***Notes*:** Base name for *Ricinocarpos rosmarinifolius* (A.Cunn.) Benth.

7. **Croton stigmatosus** var. **eurybioides** Baill., Adansonia 6: 301 (1866). ***nom. nud.*** **Type:** not designated.

Notes: There is no diagnosis and no type for this name.

8. **Croton storckii** (Muell.Arg,) A.C.Sm., Bull. Bishop Mus. 141: 83 (1936).

***Notes*:** This name was misapplied to Australian material by Airy Shaw (1980b, 1981). The populations concerned are referrable to *Croton mutabilis*.

9. **Croton urticoides** A.Cunn. in Field, Geographical Mem. New South Wales 355 (1825).

This is *Adriana urticoides*, see Appendix.

10. **Croton viscosus** Labill., Nov. Holl. Pl. Sp. 2: 72 (1806).

***Notes*:** Base name for *Beyeria viscosa* (Labill.) Miq.

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Appendix

Adriana urticoides (A.Cunn.) Guymer, **comb. nov.**

Croton urticoides A.Cunn., Field Geographical Memoirs on NSW 355 (April 1825). **Type:** Cox's and Macquarie Rivers, *A. Cunningham*, Oct-Dec 1822 (Chelsea Physic Library, London, U.K. (n.v.), see Mabberley (1978)).

Adriana tomentosa Gaudich., Ann. Sciences Nat. 5:223 (8 July 1825). **Type:** 'Habitat in Nova-Hollandia (Orientali.) Baie de Chiens Marins, Uranis, *C. Gaudichaud*' (lecto: P, *fide* Gross & Whalen 1996).

Two varieties were recognised by Gross and Whalen (1996) based on their research of morphological characters. As these varieties are worthy of recognition, new combinations are provided for them below.

Adriana urticoides var. **urticoides**

Adriana tomentosa Gaudich. var. *tomentosa*

See Gross and Whalen (1996) for a complete list of synonyms.

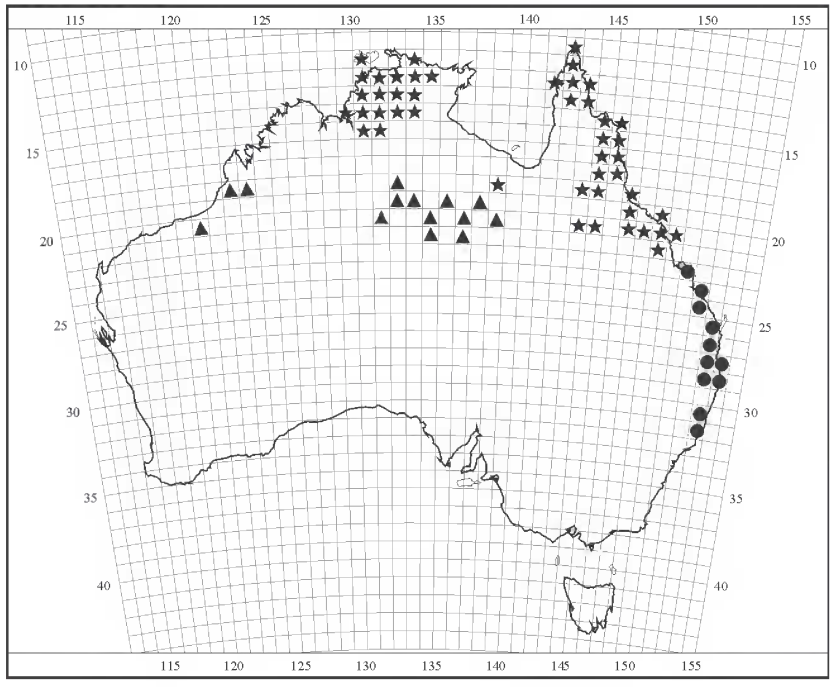
Adriana urticoides (A.Cunn.) Guymer var. **hookeri** (F.Muell.) Guymer, **comb. nov.**

Adriana tomentosa Gaudich. var. *hookeri* (F.Muell.) C.L.Gross & M.A.Whalen, Austral. System. Bot. 9:765 (1996); *Trachycarpon hookeri* F.Muell., Trans. Proc. Phil. Soc. Victoria 1:16 (1854). **Type:** "On sand ridges along the Murray, towards the junction of the Darling and Murrumbidgee", *F. Mueller* (lecto: E (n.v.), *fide* Gross & Whalen 1996).

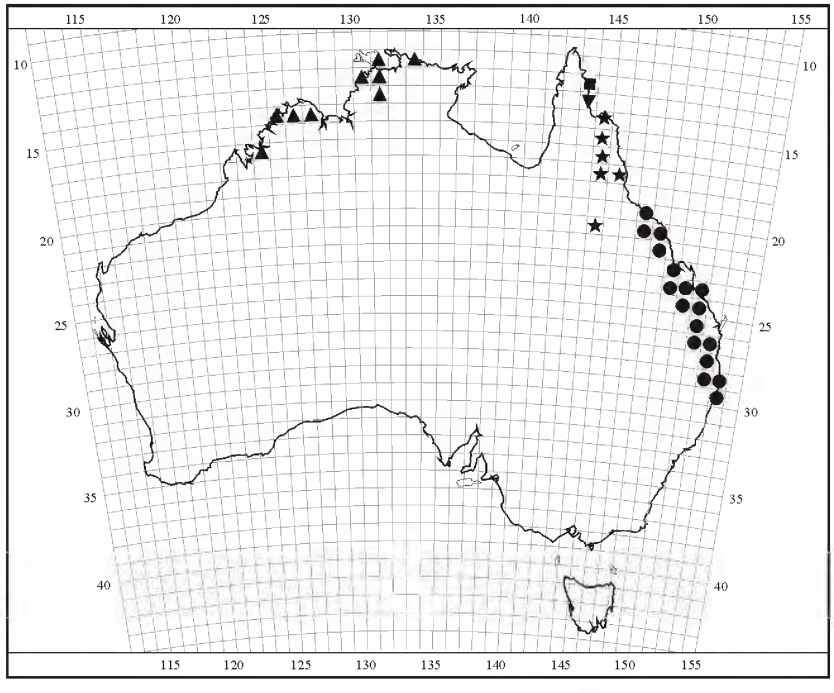
See Gross and Whalen (1996) for a complete list of synonyms.

Mueller Argoviensis in A. de Candolle's *Prodromus* (1866) was the first to recognise that *Croton urticoides* was a species of *Adriana* and referred to it as *Adriana acerifolia* Cunn. ex Hook. var. *genuina* nom. inval. in his list of excluded names at the end of his treatment of *Croton* (p. 699). However, he did not include *Croton urticoides* as a synonym of any name under *Adriana* in his treatment of that genus in the same publication (p. 889). Index Kewensis (1895) reported *Croton urticoides* as *Adriana glabrata* and more recently the University of Wisconsin on their *Croton* website has incorrectly referred *Croton urticoides* to *Adriana tomentosa* var. *tomentosa*.

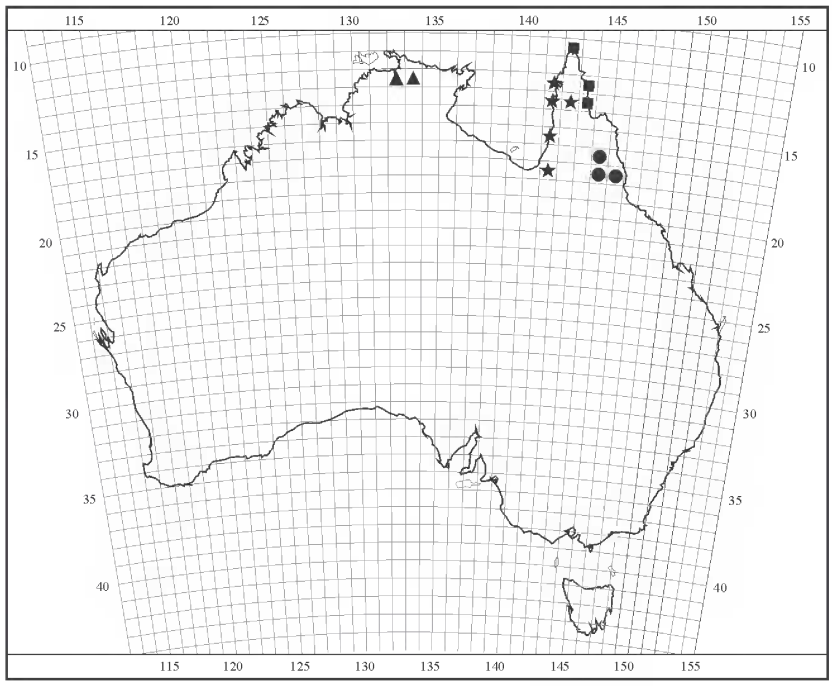
The type of *Croton urticoides* was collected by Allan Cunningham and is presumably held in the 'book' herbarium of Robert Heward's in the Chelsea Physic Garden's library in London. Mabberley, in Taxon 27: 489–491 (1978), reported the discovery of Heward's 'book' herbarium entitled "Specimens described in Field's memoirs as a specimen of the botany of the Blue Mountains" in this library.



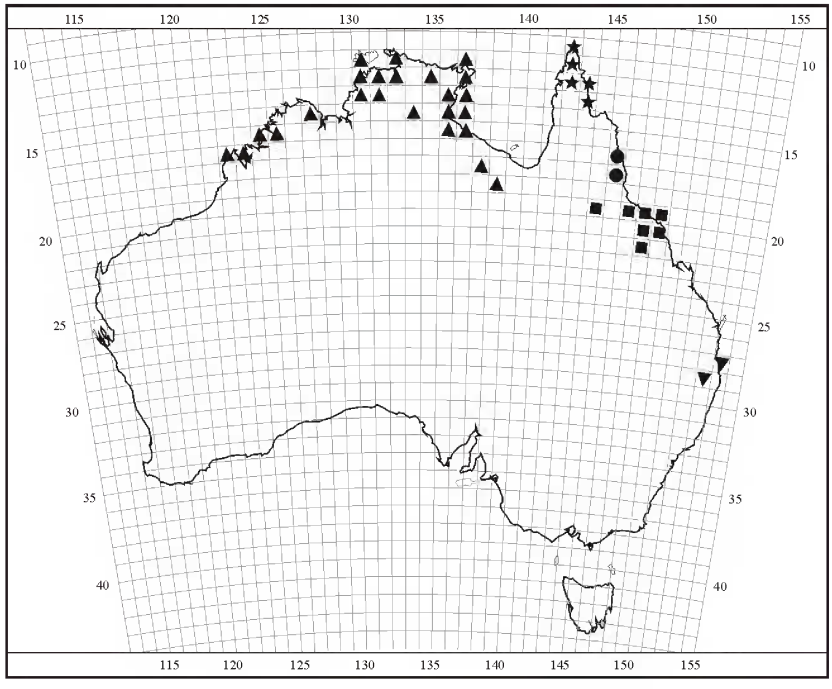
Map 2. Distribution of *Croton* in Australia. ▲ *C. aridus,* ★ *C. arnhemicus,* ● *C. stigmatosus.*



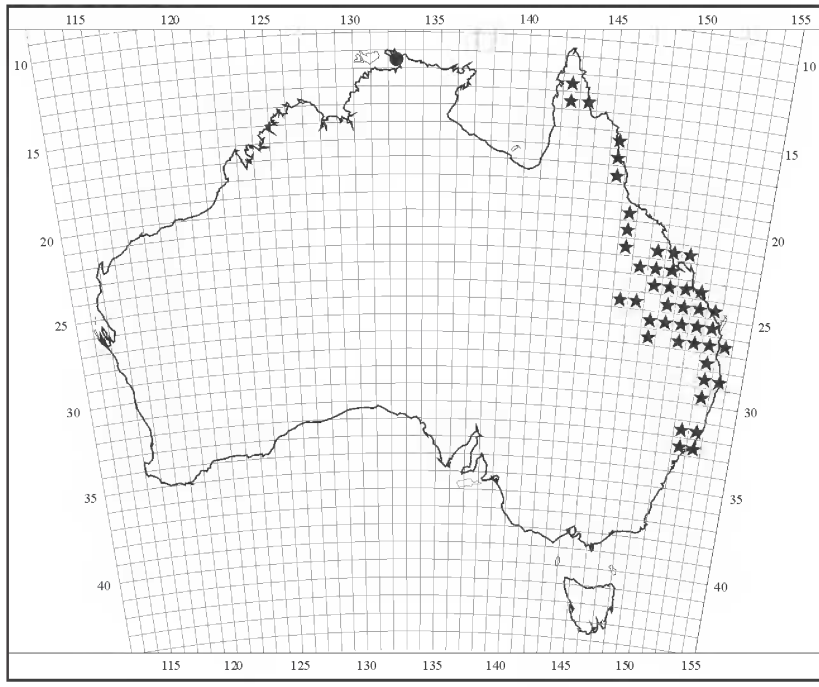
Map 3. Distribution of *Croton* in Australia. ▲ *C. schultzii,* ■ *C. brachypus,* ★ *C. multicaulis* subsp. *velutinus,* ● *C. acronychioides,* ▼ *C. choristadenius, & C. simulans, & C. stockeri.*



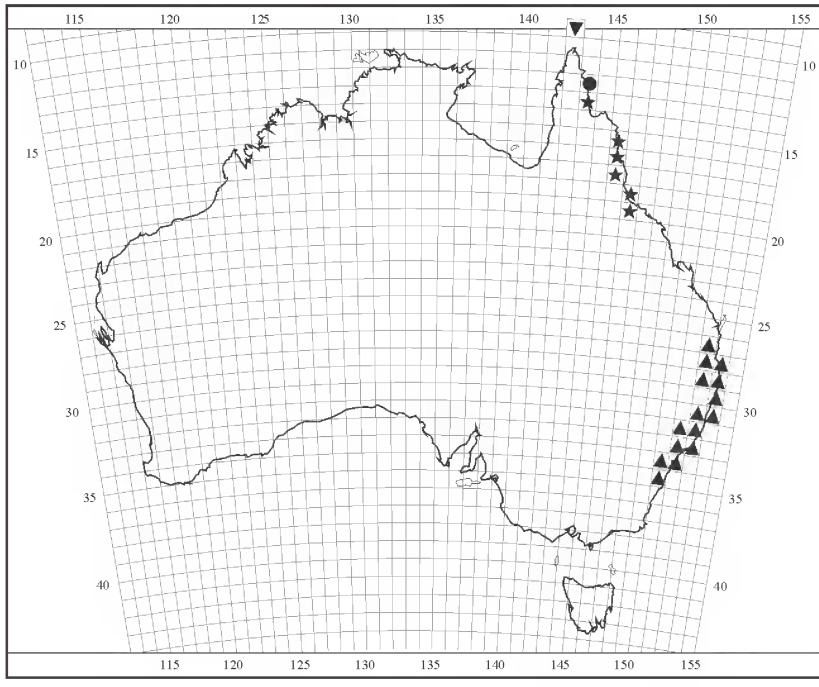
Map 4. Distribution of *Croton* in Australia. ▲ *C. byrnesii,* ■ *C. dockrillii,* ★ *C. rarus,* ● *C. minimus.*



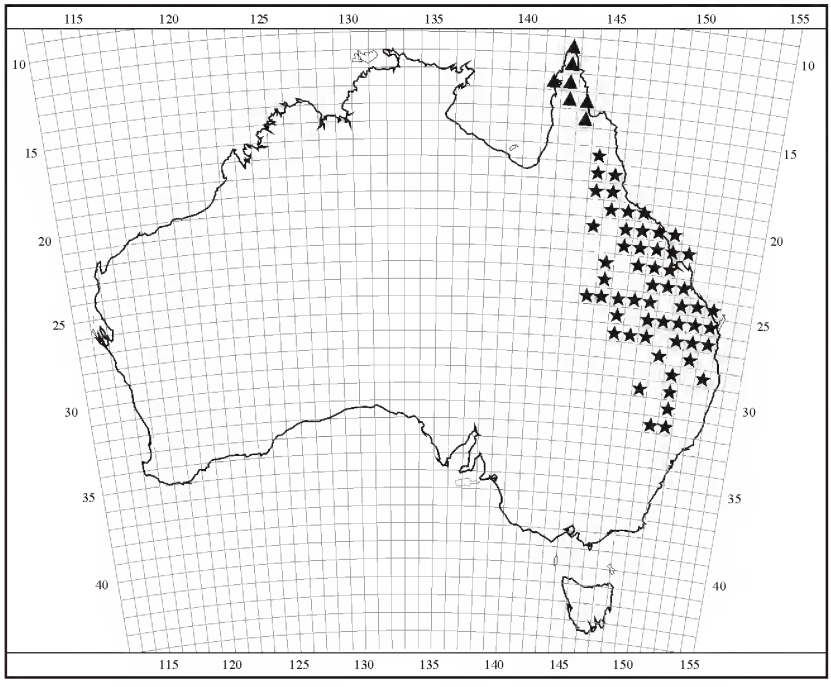
Map 5. Distribution of *Croton* in Australia. ▲ *C. habrophyllus,* ★ *C. capitis-york,* ● *C. densivestitus,* ■ *C. magneticus,* ▼ *C. mamillatus.*



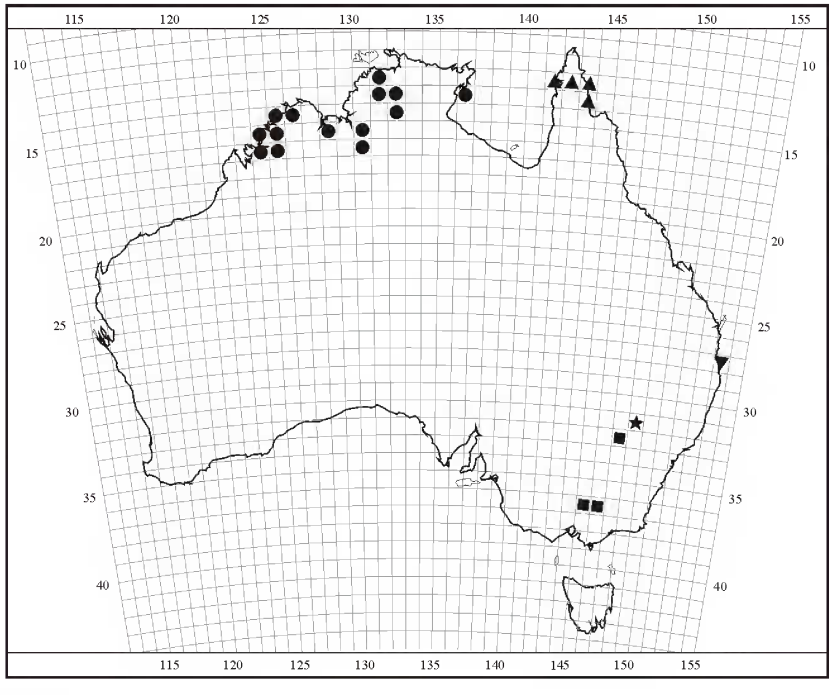
Map 6. Distribution of *Croton* in Australia. ★ *C. insularis,* ● *C. armstrongii.*



Map 7. Distribution of *Croton* in Australia. ● *C. caudatus,* ★ *C. triacros,* ▲ *C. verreauxii,* ▼ *C. waterhouseae.*



Map 8. Distribution of *Croton* in Australia. ▲ *C. multicaulis* subsp. *multicaulis*, ★ *C. phebalioides.*



Map 9. Distribution of *Croton* in Australia. ● *C. tomentellus*, ▲ *C. mutabilis*, ★ *C. capitatus*, ■ *C. setigerus*, ▼ *C. glandulosus.*